THE AMERICAN
JOURNAL OF PHARMACY

MAY, 1896.

HOW TO DISTINGUISH THE VIBURNUM BARKS IN THE STATE OF POWDER.

By L. E. Sayre,

Member of Research Committee C, of the Committee on Revision of the United States Pharmacopœia.

In a paper communicated to this journal a few months ago,[1] the writer discussed certain physical characteristics of the Viburnum barks, with a view to their identification in the state of powder. The problem presented to the Research Committee, with reference to the subject, was formulated as follows:

(1) What are the distinguishing characteristics which will identify the bark of the stem and the bark of the root of Viburnum prunifolium?

(2) How can one distinguish between the bark of Viburnum prunifolium and V. opulus?

(3) What are the differential characteristics of these barks which will enable one to distinguish between them in the crushed or powdered condition?

The first and second of these problems were discussed in the former paper, the third was left for a future one. Cross-sections of the stem bark of V. opulus and of the bark of the root of V. prunifolium, as seen under the microscope, were then presented, and are reproduced now (see *Figs. 1* to *4*). It was shown in the case of V. opulus that in the inner layer of the bark there were large clusters, in the form of elongated bands, of bast fibres, associated with but few

[1] Amer. Jour. Pharm., 67, 387.

stone-cells, these interrupted bands being separated from each other radially by narrow medullary rays, and longitudinally by broader bands of soft bast. The presence of tannic matters in the middle bark, in the soft bast and in the medullary rays was referred to. It

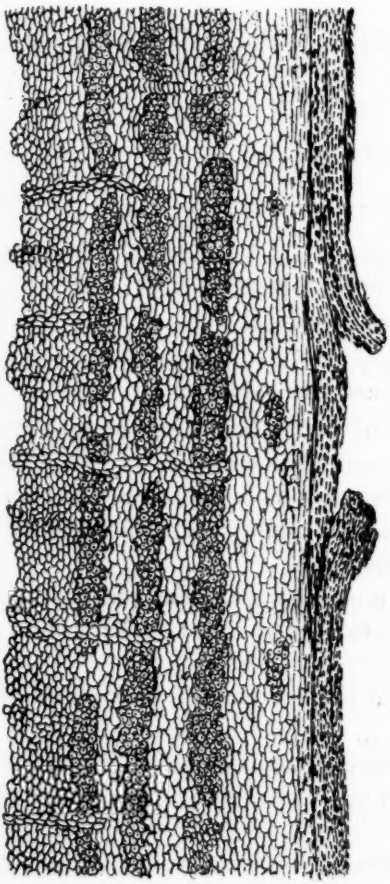


Fig. 1.—Viburnum opulus. Bark of stem. Cross-section.

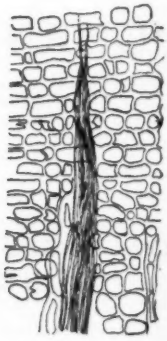


Fig. 2.—Viburnum opulus. Bark of trunk. Longitudinal section.

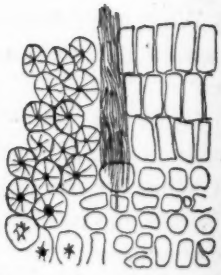


Fig. 3.—Viburnum prunifolium. Bark of trunk. Longitudinal section.

was shown in the case of V. prunifolium that it contained, instead of the bands of bast fibres, numerous groups of stone-cells irregularly disposed. Longitudinal sections were also shown, making clear the points made—that these barks were quite different in structure. The statement was made that it was probably possible to distin-

guish between the V. opulus and the V. prunifolium in the powder by the presence or absence, in the powder, of stone-cells. A further report on this point was promised when some experience had been obtained in working with the powders. It is intended, therefore,

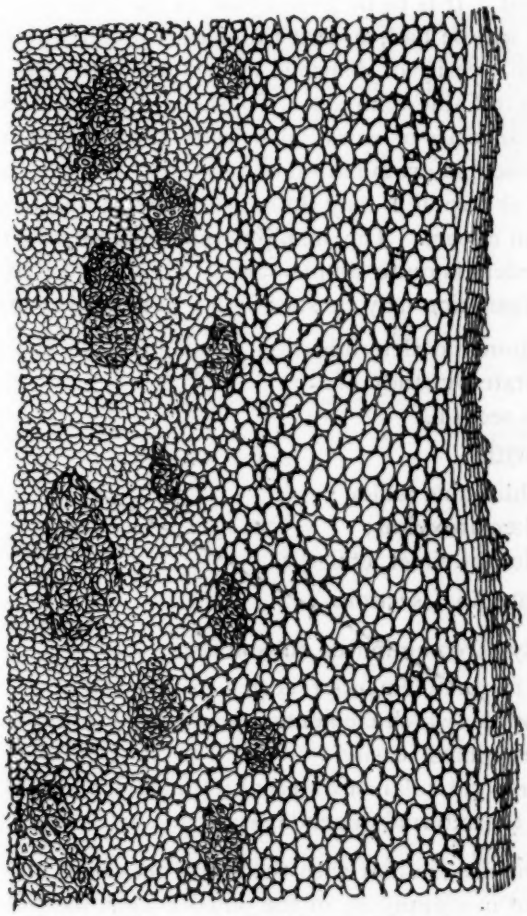


Fig. 4.—Viburnum prunifolium. Bark of root. Cross-section.

in this paper to discuss this question, and, to connect it with the last paper, I should say that the third problem above mentioned will be considered: What are the differential characteristics which will distinguish the powdered barks under the microscope?

I should state here, to those who have offered to share with me

in this work, that I have been unfortunate in being unable to furnish them with authentic material to work upon. The material collected by the chairman of the sub-committee taking up this work has been only sufficient for my own work; a further supply has not as yet been received. It is to be hoped that in the near future abundance of material will be had, so that those who would kindly further the investigation—verify or disprove what I have to say—will be furnished with reliable samples. To those whose experience is quite limited in this class of work, who desire information as to methods in the microscopic examination of powders, it might be in place to say a word or two, if I may do so without seeming to impart information as an expert. The manipulation necessary to the examination of powders is quite simple—not at all complicated.

The manipulation may be stated, in a general way, as follows:

I. Location and determination of elements in the substance in the whole state by study of—

(1) Cross-section.

Treat with

a, Chlor-zinc iodide;

b, Hæmatoxylon;

c, Methyl violet, etc.

(2) Longitudinal section.

II. Study of comminuted substance:

(1) Seek for the elements revealed in the section.

(2) Determine which elements remain most firmly adherent, and which separate most easily.

(3) Observe cuticular or external fragments, shape of cells, etc.

(4) Seek for external appendages, hairs, etc.

Those who are familiar with the above reagents know that they will often aid in identifying in the powder what has been located in cross and longitudinal section. The same reagents used in both cases will act the same, and thus identification is facilitated. Before being able to identify drugs in the powdered condition it is necessary to fix upon some feature of it that is most prominent and characteristic. In the case of leaves, for instance, there are often hairs and glands that, in their form, seem at once to distinguish the specimen upon which they occur. As an example, digitalis may be

mentioned. Growing upon the surface of the leaves are numerous hairs which are multicellular and characteristic; these in the powder are not completely destroyed, as are not other important histological elements. Even the class of powders known as impalpable, while they present greater difficulty, there is almost always found in them some elements and fragments whose characteristics are constant and sharp, which the pulverization has not greatly modified. If, perchance, they are broken into fragments, the fragments retain characteristic markings and serve as means of identification. The following procedure in the examination may be modified to suit

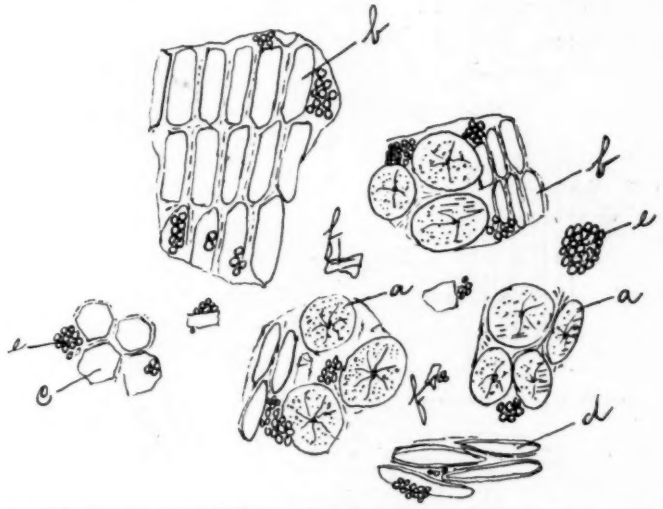


Fig. 5.—Viburnum prunifolium. Powdered root-bark, × 400: *a*, stone-cells; *b*, inner bark cells; *c*, middle bark cells; *d*, inner cells of middle bark; *e*, starch grains; *f*, fragments of cork layer.

certain different powders, but it is a general direction which will serve in most cases. Add a few particles of the well-mixed powder in a porcelain capsule containing a mixture of alcohol, glycerin and water; after about two hours' maceration, examination is commenced, when the nature of the elements enclosed in the cells, which have not been destroyed by pulverization, can be determined (starch, aleurone, inulin, etc.). To render more apparent the forms of the various separated elements and fragments, boil the powder in an alkaline water. In this manner one can distinguish more quickly and more completely all of these histological peculiarities, which

were rendered partly invisible by the presence of their contents. It is essential, when examining the fluid mixture of the powder (in, say, a homœopathic vial), to take samples from the bottom, middle and top of the fluid, in order to obtain all of the elements. In the case of Viburnum prunifolium, doubtless the stone-cells will be found in the bottom of the bottle after it has stood for a time.

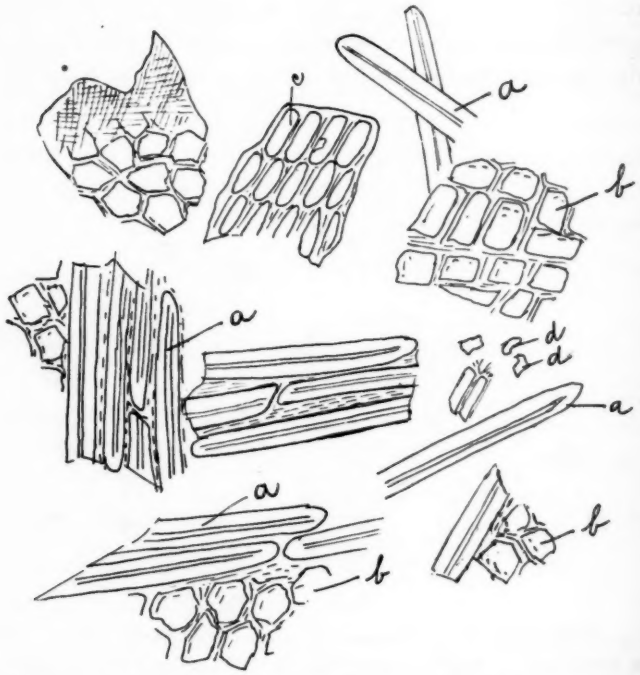


Fig. 6.—Viburnum prunifolium. Powdered trunk-bark, × 400: *a*, stone-cells; *b*, inner bark cells; *c*, middle bark cells; *d*, outer cells of middle bark; *e*, inner cells of inner bark; *f*, cells from outer layer.

A word in regard to drawings and the meaning of illustrations. In order to present an intelligible representation of the microscopical elements of a powder, or to understand these representations, it should be understood that it is necessary, in some cases, to eliminate certain features, and to accent others. The true picture, in order to be descriptive, may be obtained by selecting from many different views; so that any drawing, such as I have presented here, is understood as what could be seen under most favorable circumstances.

The forms are what may be seen if thickness of fragment, coloring matter and other causes do not prevent.

DESCRIPTION OF THE POWDERS.

Viburnum Prunifolium, Bark of the Trunk.—A brownish or reddish-gray powder, darker, by several shades, than that of the other varieties; taste slightly bitter. Under the microscope the absence of fibrous tissue is noticeable. The stone-cells are readily distinguished and quite numerous, as they are in the bark of the twigs and in the bark of the root. See *Fig. 6.*

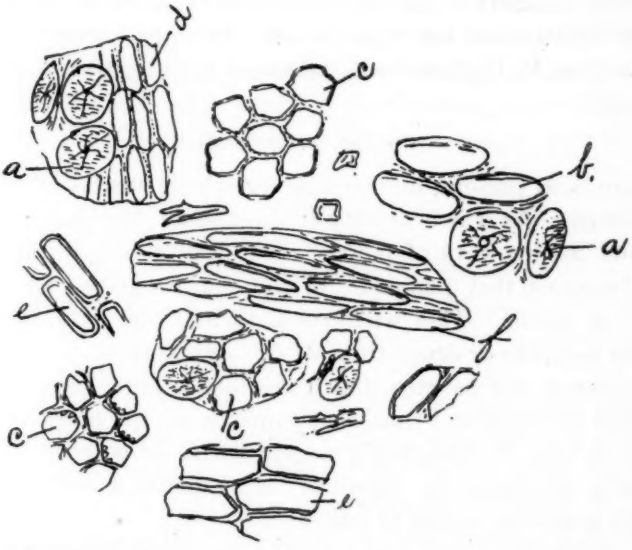


Fig. 7.—Viburnum opulus. Powdered bark, × 400: *a*, bast fibres in bark, situated in middle bark; *b*, middle bark cells; *c*, outer layer of middle bark; *d*, fragments of cork layer.

Viburnum Prunifolium, Bark of the Twigs.—A light brownish-gray powder, very easily pulverized. When viewed under the microscope there is a close resemblance to the trunk bark, and the difference seems too slight to be shown in a drawing. The color is quite characteristic.

Viburnum Prunifolium, Bark of the Root.—A grayish powder. Under the microscope a sharp distinction from the above is apparent. It displays a great number of starch granules, which, of course, is more pronounced by treatment with iodine T. S. The difference

from the others is thus brought out very visibly. Taste much more bitter. See *Fig. 5*.

Viburnum Opulus.—A silvery-gray powder. Under the microscope it presents a fibrous appearance, the wood fibres being numerous.

In this bark a solution of ferric chloride showed a decided reaction in bringing about a darkening of the tissues of the middle layer. See *Fig 7*.

As to the drawings accompanying this paper, I desire to state they represent the average appearance of the powders represented.

Several students in the laboratory have verified the work, and the present illustrations are copies of the drawings of one of our students—Wm. V. Ingham—who observed the directions I have above outlined.

COLORS OF POWDERS.

There is, at present, no standard to which shades of colors may be referred. As it is necessary to have some standard for comparison, and as this work of powder identification is in its incipiency, I would suggest that a standard of tints be recognized to avoid confusion of terms. This will appeal to any one who has tried to identify powders or drugs from written descriptions of color. There is, at present, in existence, and accessible to every one, a graduated standard of colors and tints that would serve the purpose most exactly. I refer to Ridgway's nomenclature of colors.[1] Adopting this as a standard, the colors of the Viburnum barks in No. 60 powder would be stated as follows:

Viburnum prunifolium, trunk bark	7, walnut-brown.
V. prunifolium, twig bark	19, wood-brown.
V. prunifolium, root bark	12, olive-buff.
V. opulus	15, vinaceous-buff.

This suggestion exposes me to the criticism of being blessed with an over-refinement of nicety, it is true; but the matter of identification is getting down to a fine point, as it were, and a suggestion, such as has been made, may be at least found worthy of discussion. It may be argued that colors of powders change from many causes; but, while this is true, if a color is mentioned, it should be done in an accurate way.

[1] "A Nomenclature of Colors for Naturalists." By Robert Ridgway.

COMPOUND SYRUP OF WHITE PINE.[1]

By Robert S. Sherwin, Ph.G.

Compound syrup of white pine is a very popular expectorant that is used in many parts of this country.

All large manufacturing pharmacists who do not deal solely in specialties manufacture this syrup. Originally the formulas varied somewhat. One of these older formulas was as follows, for one fluid ounce:

White pine bark	20 grains.
Ipecac	15 "
Chloroform	4 minims.
Morphine acetate	⅜ grain.

The names of the ingredients that I selected to manipulate were taken from the label of a large manufacturing pharmacist. His syrup, from the information I have obtained, has by far the widest sale.

According to the labels on a number of different syrups, the ingredients are practically identical.

I have found that the white pine bark that is used in this preparation should be taken from those parts of the limbs or trunk on which either little or no cork formation has taken place, as those parts contain the most oleoresin.

The bark from the older parts of the tree, and especially that from old trunks, contains practically no oil and very little resin; it is composed almost entirely of cork. This older, corky bark is all that I have been able to obtain from different wholesale druggists. When making this syrup I collected the bark myself. I have found that it is collected more easily in the spring of the year than in the late summer or fall. I have made the syrup from both the fresh and dried bark, and find the dried to be not only more easily manipulated, but also to afford a better preparation. In preparing the syrup I use the sulphate of morphine. The hydrochlorate may be used, and the acetate is used by some manufacturers; the latter, however, is not so invariable in quality as the sulphate. I use one-half the quantity of chloroform that is stated on the labels of the various manufacturing pharmacists, yet my finished product contains more chloroform than any of the commercial samples that have

[1] Abstracted from a thesis presented to the Philadelphia College of Pharmacy.

come into my hands. Therefore, the manufacturers either do not put in as much as they state or it is lost by evaporation before it reaches the retail trade. All of the samples of the syrup on the market which I have examined contain coloring substances. I made my first lot of syrup by exhausting the drugs with a hydro-alcoholic menstruum, and dissolving the morphine sulphate, chloroform and sugar in the medicated percolate. This procedure yielded an unsatisfactory product, yet it was very much like the numerous syrups on the market. In a second attempt I exhausted the drugs with a menstruum composed of 2 parts of glycerin and 1 part of water, and dissolved the morphine, chloroform and sugar in the medicated percolate. This method gave a better product than the first did, but it was not as satisfactory as the preparation yielded by the following plan, which has given the best results so far:

White pine bark, Wild cherry bark	of each	65·0 grammes.
Balm of Gilead buds, Spikenard root	of each	8·7 "
Sanguinaria root		6·5 "
Sassafras bark		4·4 "
Morphine sulphate		0·4 "
Chloroform		4·0 c.c.
Glycerin		150·0 "
Sugar		700·0 grammes.

Water, a sufficient quantity to make 1,000 cubic centimetres.

Mix the glycerin with 300 cubic centimetres of water. Having mixed the white pine bark and other vegetable drugs, reduce them to a No. 40 powder. Moisten the powder with a sufficient quantity of the menstruum, and allow it to macerate for twenty-four hours; then pack it firmly in a cylindrical glass percolator, and gradually pour on the remainder of the menstruum. When the liquid has disappeared from the surface, follow it with water, continuing the percolation until 500 cubic centimetres are obtained. Dissolve the morphine sulphate and chloroform, and then the sugar, in the percolate by agitation without heat, strain and pass enough water through the strainer to make the product measure 1,000 cubic centimetres.

Each 30 cubic centimetres of the product represent:

White pine bark	2·000 grammes.
Wild cherry bark	2·000 "
Balm of Gilead buds	0·250 "
Spikenard root	0·250 "
Sanguinaria root	0·180 "
Sassafras bark	0·120 "
Morphine sulphate	0·012 "
Chloroform	0·120 c.c.

The foregoing process makes a beautiful, bright and permanent preparation, that may be given in doses of from one to three teaspoonfuls.

This syrup is as easily prepared as syrup of wild cherry. It costs less than $1 per gallon, while those brands on the market are sold for about $3.50 per gallon. It can be put up in bottles holding 4 fluid ounces, and syrup, bottles, corks and labels need not cost over 60 cents per dozen.

Inasmuch as the compound syrup of white pine is used over such an extensive territory, and its sale in some parts of this territory is so enormous, I am of the opinion that there should be a formula for its preparation in the National Formulary. I believe the compound syrup of white pine is now used much more than a number of preparations which are now recognized in the National Formulary. Since Mr. Sherwin's thesis was deposited with the Faculty of the College, we have received a copy of the new and revised edition of the National Formulary, and find that compound syrup of white pine is recognized therein under the title of Syrupus Pini Strobi Compositus. We print the formula in full, so that comparison with Mr. Sherwin's formula may be easily made.

White pine bark (Pinus Strobus)	75	grammes.
Wild cherry bark	75	"
Spikenard root	10	"
Balm of Gilead buds	10	"
Sanguinaria root	8	"
Sassafras bark	7	"
Morphine sulphate	0·5	"
Chloroform	6	c.c.
Sugar	750	grammes.
Alcohol	—	
Water	—	

Syrup (U. S. P.), of each a sufficient quantity to make 1,000 cubic centimetres.

Reduce the vegetable drugs to a moderately coarse (No. 40) powder, moisten the powder with a menstruum composed of 1 volume of alcohol and 3 volumes of water, and macerate for twelve hours. Then percolate with the same menstruum until 500 cubic centimetres of tincture have been obtained, in which dissolve the sugar and the morphine sulphate; lastly, add the chloroform and sufficient syrup to make 1,000 cubic centimetres, and strain.

We have not had experience with the Formulary process, which involves the use of alcohol in the menstruum for the extraction of the drugs, but we know a highly satisfactory preparation can be made by the use of water and glycerin.—*Editor.*]

THE VOLATILE OIL OF CICUTA MACULATA.[1]

By Freeman P. Stroup, Ph.G.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy, No. 153.

The boiling points of the several fractions of the oil were taken in a thin test tube placed in a sand bath, and containing just enough of the oil to immerse the bulb of the thermometer, the temperature being noted when the oil was in active ebullition. The specific gravity of the original oil was taken by means of a pyknometer, with the oil at a uniform temperature of 15° C. The specific gravities of the several fractions, owing to the small quantity of each that was obtained, were taken at 15° C., by means of an improvised bottle, and are, necessarily, only approximately correct. The various distillations and rectifications were conducted under the ordinary atmospheric pressure. The distillations necessary for fractioning the oil were conducted from an ordinary fractioning bulb over a sand bath, with a thermometer inserted in the well-fitting cork in such a manner that its bulb was on a level with the junction of the neck of the flask with the body.

At first a condenser was employed, but it was afterwards found that the fractions could be distilled from one bulb into another without its use. With the condenser it seemed impossible to get rid of all traces of water, even by repeated agitation of the oil with anhydrous calcium chloride and subsequent re-distillation. This trouble was not experienced after the condenser was discarded.

The combustions were conducted in an open tube with cupric oxide and a stream of oxygen. The vapor densities were taken by means of the Victor Meyer apparatus, and all necessary corrections for variation in temperature and barometric pressure were made in the usual way.

The quantity of oil obtained from the amount of drug obtainable was so small that it was deemed advisable not to test it as a whole, but rather to split it into its component parts, and, if possible, ascertain its chemical composition, especially as the oil had been pretty thoroughly described as a whole by Jos. E. Young, in this journal,

[1] Literature.—Jos. E. Young, Am. Jour. Pharm., July, 1855; and Robert Glenk, Am. Jour. Pharm., July, 1891.

for July, 1855, and by Robert Glenk, *ibidem*, July, 1891. From their writings I make the following extracts:

Essay by Joseph E. Young.—"One pound of the bruised seeds were distilled with water, acidulated with sulphuric acid; 7 per cent. of a colorless, very limpid, volatile oil passed over, having an insipid, oily taste, and an odor very analogous to that of Chenopodium anthelminticum; has a specific gravity of ·853, and boils at 360° F., without undergoing any change; is soluble in alcohol, ether and chloroform; it dissolves a large quantity of sulphur by heat, and deposits most of it in crystals on cooling; phosphorus is also readily taken up by the oil with the aid of heat, and also crystallizes on cooling; sulphuric acid decomposes and blackens the oil with evolution of heat; muriatic acid gas passed through it is largely absorbed, and decomposes the oil, changing its color to a dark brown without any deposition of resin; and the same reaction takes place with chlorine.

"Nitric acid acts on it powerfully. When added to the oil an explosion follows by which most of it is thrown from the vessel; the residue, on standing a few hours, deposits a thick, resinous matter, heavier than water, which, when well washed with warm water and distilled with potassa, afforded a substance having a very agreeable aromatic odor.

"The volatile oil of Cicuta maculata is neutral to test paper, but rapidly ozonizes air enclosed with it in glass bottles exposed to light, and in this respect it is more active than oil of turpentine. The corks of the vials containing it are bleached as though acted on by nitric acid, and when a strip of paper moistened with iodide of potassium and starch water is suspended in a vial above the oil, the iodide is instantly decomposed, setting free the iodine. When treated with bichromate of potassium and sulphuric acid, it yielded by distillation an acid analogous to formic acid.

Potassium, when added to the oil, decomposes it with effervescence, materially affecting its odor, and, on standing, causing it to become solid, the potassa formed from the oxidation of the potassium uniting with a portion of the oil to form a compound like resinate of potassium having a dark brown color and a soft consistence.

"About 2 drachms of the oil were treated with potassium until reaction ceased, when it had assumed a dark brown color and a soft consistence; the whole with a portion of potassium was introduced into a retort, and, by a careful application of heat, a colorless hydrocarbon oil distilled over, of the specific gravity ·830, and having a pleasant odor and a bland aromatic taste; it is rendered dark red by the action of sulphuric acid; caustic potassa digested in the oil does not affect it; nitric acid acts on it with effervescence, but without exploding; iodine combines slowly but perfectly without explosion, becoming colorless on standing."

Essay by Robert Glenk.—"The volatile oil obtained by distilling the bruised fruit with water was first of a dark color, but, on redistillation, was obtained nearly colorless; yield, 4·8 per cent.; specific gravity, ·855; boiling point, 177° C. (350° F.); soluble in 1·5 parts commercial alcohol, in all proportions of absolute alcohol and in 50 parts of glacial acetic acid.

"The following color reactions were observed: a solution of bromine in

chloroform (1 : 20) gave a brownish color; a strong alcoholic solution of hydrochloric acid colored a reddish-violet; sulphuric acid (6 drops to 1 drop of oil) became immediately dark brown; fuming nitric acid on a solution of the oil in carbon disulphide gave a brownish tint; solid iodine added to the oil dissolves slowly; picric acid on warming dissolves with an orange color."

So much can be said for existing literature on the subject. The drug used in the preparation of the oil employed in the following experiments consisted of about 2·5 kilogrammes of material, left in the care of Professor Trimble in 1891, by Robert Glenk, who had made an exhaustive study of the proximate principles of the drug.

Upon assorting the material, about 1·5 kilogrammes of clean fruit were obtained, the remainder consisting of stems, umbels, partly developed fruit, and adhering dirt. The refuse was first macerated with water over night, and then distilled, yielding by its distillation a small quantity of a light amber-colored oil. The water which came over with the oil was poured upon some of the clean fruit, more water added and the whole allowed to macerate over night. It was then distilled, the water that came over with the oil being from time to time returned to the still. The oil was carefully separated from the water and dried by agitation with anhydrous calcium chloride. The product was of a light amber color and equalled 3·82 per cent. of the drug used. Mr. Glenk's larger yield was probably due to the fact that the fruit he used was fresh, and therefore had not deteriorated through exposure to the air. The specific gravity of the freshly obtained oil was found to be ·8839. The oil was now rectified. The bulk of the distillate came over between 177° and 184° C., the last portion coming over at 225° C. The first portions came over colorless and limpid, the last portions slightly yellow and generally accompanied by some whitish-appearing particles, which disappeared when the oil stood undisturbed for a short time. The same behaviors were noticed in several subsequent rectifications, but the cause was not ascertained. The distillate was again agitated with calcium chloride and several times redistilled. Its specific gravity was again taken and found to be ·8766, showing a decrease as compared with the gravity of the original oil. Traces of moisture were still noticed, and it was found necessary to alternately agitate it with dried calcium chloride, and redistil three or four times before the last trace of moisture disappeared. The specific gravity was then found to be ·8728. Mr.

Glenk left with the fruit used in these experiments about 15 c c. of oil which he had isolated in 1891. This was redistilled and was then found to have the same general characteristics as the fresh oil; so it was mixed with the latter, and the whole afterwards fractioned as one lot. Great difficulty was experienced in obtaining fractions with constant boiling points, but it is believed that those given below are as nearly the correct fractions of the oil as can be obtained by fractional distillation alone. Nearly all of the fractions were cloudy when first collected, but afterwards became very clear. As mentioned above, this phenomenon could not be accounted for. The four fractions were neutral toward litmus paper. The decomposition products that were obtained above these fractions were acid toward that substance. Prolonged chilling did not serve to separate solid bodies from the oil or its fractions.

Number of fraction.	Temperature at which obtained.	Approximate percentage by volume.
1	176° to 178·5° (average 177°)	40
2	178° to 183° (average 179°)	35
3	180° to 190°	7
4	190° to 223°	4
5	225° (decomposition products)	4
6	Above 225° (residues)	6
7	Residues from first rectification	4

DESCRIPTIONS OF FRACTIONS.

No. 1: Colorless, limpid, very transparent oil, with strong, but not unpleasant, somewhat aromatic odor. Boiling point, 177·5° C. Specific gravity, ·8563.

No. 2: Description same as No. 1. Boiling point, 179·5° C. Specific gravity, ·8599.

No. 3: Colorless, limpid, very transparent, with strong, disagreeable odor. Boiling point, 181° C. Specific gravity, ·8664.

No. 4: Nearly colorless, limpid, transparent, with strong, unpleasant odor. Boiling point, 185° C.

No. 5: Brilliant, transparent, dark amber in color, odor empyreumatic. Boiling point above 200° C. When this fraction was being obtained, the temperature fell rapidly from 225° to 150°, thus indicating decomposition.

No. 6: Heavy, transparent; color, dark mahogany; odor, strongly empyreumatic.

Nos. 1, 2 and 3 seem to be the most important fractions, and this treatise has to do mainly with the consideration of their properties; however, some tests were made on some of the other fractions, and these will be mentioned in their proper places.

Nos. 6 and 7 were treated with alkali in order to ascertain if they were esters, but with negative results.

Strips of filter paper, moistened with potassium iodide solution and starch water and suspended above the oil in the tubes containing Nos. 1, 2 and 3, rapidly turned purple, showing the presence of a considerable amount of ozone in the air confined with the oil. The corks of these tubes became quite white in color, having been subjected to the bleaching action of the ozone produced by the oil. A few drops of each of the fractions were placed in clean, dry test tubes, and enough glacial acetic acid added to each to effect solution. This was followed in each case by the addition of a few drops of strong sulphuric acid. The following phenomena were noticed: No. 1 assumed a reddish-brown color; Nos. 2, 3 and 4 became dark purplish-red; Nos. 5 and 6 became dark purple. Upon heating, all became nearly black, and, upon cooling, became denser in consistency, Nos. 3, 4, 5 and 6 becoming quite gelatinous. Upon standing for forty-eight hours, Nos. 5 and 6 became solid. Upon longer standing, each separated into two layers, the bottom layer in each case being of a dirty brown color, and the upper layer of a purplish hue. Of the fractions themselves, Nos. 1, 2, 3 and 4 each decolorized an ethereal solution of bromine. Nos. 1 and 2 each violently decomposed strong nitric acid, and also reacted with a mixture of strong nitric acid and alcohol with almost explosive violence. Nos. 1, 2, 3 and 4 showed no change of color with a solution of ferric chloride in absolute alcohol, but No. 5 gave a dark red color. Nos. 1, 2 and 3 dissolved iodine quite readily, but not with violence, Nos. 1 and 2 decolorizing the iodine solution upon standing for some time. All of the fractions were soluble in an equal bulk of glacial acetic acid. Nos. 1, 2 and 3 were also soluble in equal bulks of commercial alcohol, acetone and ether; and in all proportions in benzin, benzol, chloroform and carbon disulphide. They were but slightly, if at all, soluble in glycerin. As most of these reactions and solubilities correspond with those of the class of

compounds called terpenes, we might almost arrive at the conclusion that these bodies are what we have in this oil. Five cubic centimetres of No. 1 were shaken with 10 c.c. of a mixture of strong sulphuric acid and water (2 : 1), to attempt to polymerize the terpene if possible. The mixture was then distilled in a current of steam, 3 c.c. of a yellow oil distilling over with the water. This oil was again shaken with about 10 c.c. of a mixture of strong sulphuric acid and water (4 : 1), and again distilled as above. The volume of oil that distilled over was much less than before. That which came over was colorless and responded to the tests applied to the original fraction, except that its action with nitric acid was not violent, although the oil was darkened somewhat by the acid. Nos. 1, 2, 4, 5 and 6 were each treated with an equal volume of a strong solution of sodium bisulphite and agitated occasionally during two days, and then allowed to stand for eighteen hours. Upon careful examination, no crystals indicative of the presence of either aldehydes or ketones could be detected in any of the samples. Combustions were now made upon fractions 1, 2, 3 and 4, in order to determine their chemical compositions.

The results justify the assertion that all are terpenes, but with slightly different boiling points. Vapor densities taken of portions of No. 2 seemed to confirm this idea, at least as far as this fraction is concerned. As the fractions resembled one another in so many other points, it was not deemed necessary to ascertain the vapor densities of more than this one fraction.

The following were the results of the eight combustions which were made :

	Fraction I.		Fraction II.	
Carbon	88.21	87.90	88.30	88.72
Hydrogen	12.07	11.29	11.40	11.77

	Fraction III.			Fraction IV.
Carbon	85.84	86.86	87.17	82.46
Hydrogen	10.91	11.45	10.14	10.33

The theoretical percentages of carbon and hydrogen in the terpene $C_{10}H_{16}$ are 88.23 and 11.77, respectively. It is known to the author that the amounts of carbon found in fractions 3 and 4 are lower than the truth. The wide range of temperature observed in the distillation of No. 4 tends to cause a doubt in my mind as to its being a distinct fraction. If it were a decomposition product, as the

variation in the temperature of distillation seemed to indicate, it certainly must have been a terpene if we judge from the combustion result.

Four trials were made on No. 2, in order to ascertain its vapor density. The results compared with air were 5·09, 5·24, 4·38 and 5·09. The theoretical density of $C_{10}H_{16}$ is 4·70, and that for $C_{15}H_{24}$ is 7·07.

Recapitulation.—The results of this investigation of the chemistry of the volatile oil of Cicuta maculata may be summed up in the following words:

The oil is composed mainly of two fractions, both terpenes, boiling respectively at 177·5° and 179·5° C.; and in addition to these are two smaller fractions, also terpenes, boiling at 181° and 185° C., respectively, and a number of smaller fractions of undetermined chemical composition, having nearly all the physical characteristics of the terpenes of the general formula $C_{10}H_{16}$

Both the oil and its fractions are readily soluble in commercial alcohol, acetone, ether, benzin, benzol, chloroform and carbon disulphide. They are insoluble in water and glycerin.

The oil and each of its two principal fractions react violently with strong nitric acid, and quietly with iodine, producing a colorless solution.

With a larger quantity of material to work upon, some future investigator may be able to prove the presence of some other substances in this oil besides terpenes; but from all the observations made during these investigations the writer is prone to believe that it is simply a mixture of terpenes with possibly a small trace of an oxygenated compound.

A CONTRIBUTION TO THE KNOWLEDGE OF SOME NORTH AMERICAN CONIFERÆ.

By Edson S. Bastin and Henry Trimble.

(*Continued from page 210.*)

THE TURPENTINE INDUSTRY.

The resinous products of the Coniferæ and their derivatives are known in commercial circles as *naval stores*. This industry has been carried on in the Southern United States for about two centuries. The following historical data are of considerable interest, and are taken in part from Bulletin No. 5 of the North Carolina

Geological Survey,[1] and in part from the Report of B. E. Fernow, Chief of United States Forestry Department, for 1892:

"As early as 1700 the production of naval stores was an industry of some importance in the Colony of Carolina. At the same time the industry was carried on in the adjacent parts of Virginia. In Virginia the products were largely derived from the loblolly pine, while in North Carolina they came from the long-leaf pine. The products exported from the Colony at that time were tar and pitch, and some crude turpentine; but the quantity of the latter shipped was small. Tar kilns were made then as now, and the process of burning was the same. Indeed, the process is very much the same as that described by Theophrastus as being used by the ancient Greeks.

"Until about 1800 the making of tar was not as largely confined to North Carolina as it is at present, nor even to the Southern States. Besides being burnt in Virginia from the loblolly and short-leaf pines, some was made in New York and other Northern States from the pitch pine (Pinus rigida), but more for home use than for export.

"In the three years—1768 to 1770—88,111 barrels of crude turpentine, 20,646 barrels of pitch and 88,366 barrels of tar were on the average annually exported to the mother country, representing a value of $215,000 in our present currency. In its infancy the manufacture of naval stores was confined to the district between Tar and Cape Fear Rivers, with Wilmington and Newberne for shipping ports. Most of the crude resin was shipped to England. Later, the distillation of spirits of turpentine was carried on to a small extent in Northern cities as well as in North Carolina. Up to the year 1844, fully one-half of the crude product was subjected to distillation in the latter State, the process being effected in clumsy iron retorts; the introduction of the copper still in 1834 led to a largely increased yield of volatile oil, and this industry received a strong impetus. The number of stills at the ports was increased, and the production grew yet further shortly afterward, caused by the new demand for spirits of turpentine in the manufacture of india-rubber goods, and turpentine orcharding was rapidly extended to the south and west of its original limit. As early as 1832 rectified spirits of turpentine was used for an illuminator, and for that purpose came into general use in 1842, either alone in the rectified state, or mixed with a certain quantity of strong alcohol, under the names of camphene and burning fluid, furnishing the cheapest light until replaced by the products of petroleum. The large consumption of spirits of turpentine in this way caused such an increase in its production that the residuary product, rosin, was largely in excess of the demand, leading to a great depreciation of this article. The consequent reduction of the profits of the business caused the transfer of the still from the place of shipment to the source of the raw material—the forest. From that time (1844) dates the great progress made in the expansion of this industry to the virgin forests farther south, and the turpentine stills increased rapidly in number in South Carolina, Georgia, Florida and the Eastern Gulf States.

"During the war of secession, when the production in the South was stopped,

[1] *The Forests, Forest Lands and Forest Products of Eastern North Carolina*, by W. W. Ashe, in charge of forest investigation, Raleigh, 1894.

the turpentine industry of France received an impetus, and that country supplied, as best she could, the deficiency. Prices went up to five or six times their former range, namely, $25 to $30 per 100 pounds for spirits, and $9 to $10 for pale yellow grades of rosin, $4 to $5 for inferior grades. These prices instigated improvement of methods, such as the Hugues system, described further on, and more careful treatment of the crop.

"With the close of the war the industry revived in the United States, though the demand for turpentine was not as great as formerly, petroleum products of various kinds having been found to take the place of the product of the pine for many purposes."

While the Pinus palustris is the source of the largest proportion of naval stores, still a considerable quantity is yielded by P. taeda, the loblolly pine; P. echinata, the short-leaf pine; and P. Cubensis, the Cuban pine. The product from P. rigida in the North Atlantic States is now a matter of history, the supply from that source having long since been exhausted.

At present the long-leaf pine furnishes the great bulk of the supply, not only for the United States, but for the whole world, the production of France and Austria, the only other producers of naval stores, furnishing hardly one-tenth of the total production. The world's supply amounts in value to something over $10,000,000 annually.

The geographical distribution of the turpentine-yielding pines is very similar to that laid down for Pinus palustris on a previous page, and embraces portions of the following States: North and South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas and Texas.

Turpentine orcharding[1] is that branch of the naval store industry which is immediately concerned with the collection of the resinous products. It has been found that the trees best adapted to tapping are those not less than 15 inches in diameter and in vigorous growth. Trees over 10 inches in diameter will yield almost double the amount of resin that a smaller tree will produce, and at the same time the resin is much richer in volatile oil. Notwithstanding the fact that younger trees give an inferior yield, yet saplings scarcely over 8 inches in diameter are frequently boxed.

Boxing is the term given to the operation of cutting the cavities or boxes, which are to be the receptacles of the crude turpentine.

[1] In addition to the reports referred to, excellent brief descriptions of the turpentine industry may be found in AM. JOUR. PHARM., 1890, p. 284 (Dunwody), and p. 393 (Murray).

The boxes and method of chipping can best be understood by reference to *Fig. 23*, taken from the U. S. Government previously referred to, which shows a boxed and hacked tree, as well as a section of the same in outline. While this illustrates the principle of boxing and chipping in a satisfactory manner, still the appearance of the trees may be better understood from *Figs. 24* and *25*, which are reproduced photographs of sections of trees exhibited at the recent exhibition in Atlanta, and now to be seen at the Commercial Museum, Philadelphia.[1] *Fig. 24* shows the surface of the chipped tree covered with "scrape" about the end of the season, when the resin has ceased to flow. *Fig. 25* shows a tree just after "boxing" and "cornering" in the spring, before the flow has commenced. These boxes are cut during the winter, when no resin is running. The instrument used is a peculiar, long and narrow axe. The lower edge of the box is from 8 to 12 inches above the ground. The greatest diameter of the box, *d* to *e* (*Fig. 23*), is 14 inches; depth, *b* to *f*, 7 inches; width, *b* to *c*, 4 inches; and height, *a* to *b*, 6 to 7 inches. From two to four boxes are cut in a tree, according to its size.

With the advent of spring, about the 1st of March, the resin begins to flow, and active operations commence. *Cornering* is first effected; this consists in removing the bark and the youngest layer of wood from two triangular spaces immediately above the box to a height of about 10 inches. The resin exudes rapidly on warm days and flows into the box. In the course of eight or ten days the surface becomes clogged, and two diagonal cuts or hacks are made so as to expose a fresh surface; this is accomplished by a peculiar instrument, termed a *hacker* (*Fig. 26*), which consists of a curved knife attached to an iron or wooden handle, bearing at the opposite end an iron ball weighing about 4 pounds. The momentum given by the heavy ball enables the skilled workman to make the two diagonal cuts with two blows. These *hacks* are made every eight or ten days from March to October, or sometimes until the middle of November. The height of the chipped surface is increased from 1½ to 2 inches

[1] Our thanks are hereby tendered to Dr. Charles Schäffer for these photographs, as well as the one illustration of the Schuler system in this same contribution; also, to Dr. William P. Wilson, Director of the Philadelphia Commercial Museum, for the special effort on his part to have the exhibit set in place, in order that the illustrations might be ready for this article.

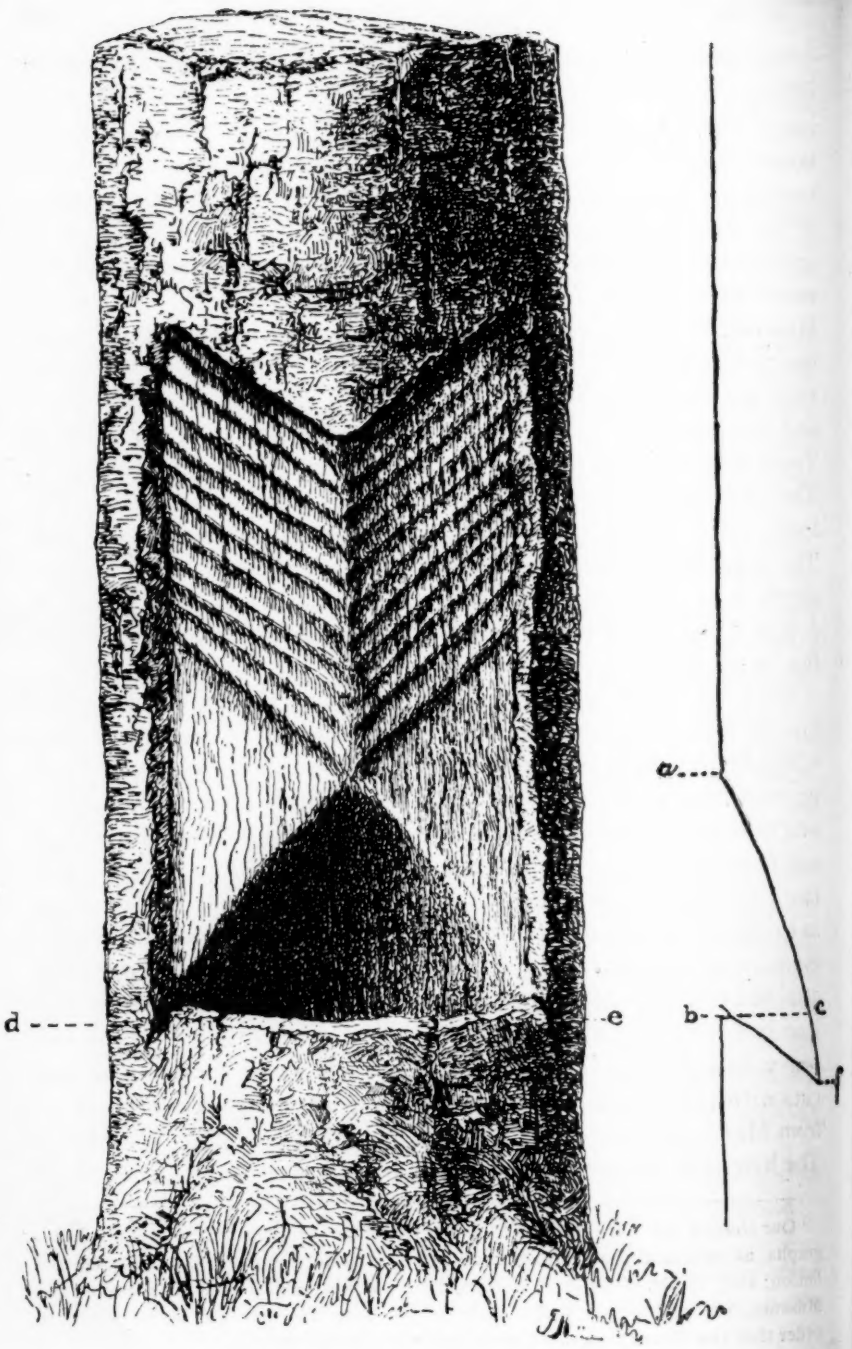


Fig. 23.—A boxed, cornered and chipped tree.

Fig. 24.—A boxed, cornered and chipped tree covered with *scrape.*

Fig. 25.—A boxed and cornered tree.

every month. The flow of resin is most abundant during June, July and August, decreasing as the cooler weather approaches.

The resin which accumulates in the boxes the first season is known as *virgin dip*, and is removed by a flat *dipper* to barrels for transportation to the still. On an average, seven dippings or collections are made the first season of about thirty-two weeks. About 40 barrels of crude resin (soft gum) is obtained from 10,000 boxes at each dipping. The net weight per barrel is about 240 pounds. As the flow of resin diminishes it hardens on the surface; this is then removed with the *scraper* from the face of the tree. The product is known as *scrape* or hard turpentine, and it is decidedly of inferior quality to the *dip*. It is of a dingy white color, contains particles of wood, bark and dust, and yields only about half the volatile oil obtained from the dip.

In the first season the average yield from 10,000 trees of dip amounts to 280 barrels, and of scrape to 70 barrels. The former yields 6½ gallons of spirit of turpentine to the barrel of 240 pounds net, and the latter 3 gallons to the barrel, resulting in the production of 2,000 to 2,100 gallons of spirit of turpentine, and 260 barrels of rosin of the higher and highest grades.

In the second year from five to six dippings are made, the crop averaging 225 barrels of soft turpentine, while the scrape is increased to 120 barrels, making altogether about 2,000 gallons of spirit and 200 barrels of rosin; the latter is of a lighter or deeper amber color, perfectly transparent and of medium quality.

In the third and fourth years the number of dippings is reduced to three each. The freshly hacked surface is so much higher, causing the resin to flow over so much more surface, that comparatively little reaches the boxes. In the third season the dip amounts to 120 barrels, and the scrape to 100 barrels, yielding about 1,100 gallons of spirit and 100 barrels of rosin of a more or less dark brown color, and not quite transparent.

In the fourth and last year the yield of dip is somewhat less than that of the previous year, while the scrape remains about the same, 100 barrels, yielding in all about 800 gallons of spirit and 100 barrels of the lowest grade of rosin, which is opaque, heavy and of a deep brown, almost black, color.

Owing to the reduction in the quantity and quality of the raw product, it is not considered profitable by the larger operators to

work the trees for a longer time than four years. In North Carolina, the smaller land owners work their trees for eight to ten successive seasons or more, protect the trees against fire, and after giving them rest for a series of years apply new boxes on spaces left between the old boxes with good results; this operation is known as *reboxing* or *back-boxing*.

The process of turpentine gathering, as just described, and as at present carried out, is almost as wasteful a one as could be devised. The loss by evaporation of the volatile oil alone is an enormous one. To this may be added the rapid destruction of the tree for turpentine purposes, and the loss by fire to which the larger surface of flowing resin offers especial attraction.

The resin taken from the long-leaf pine at least comes from the sapwood alone, the heartwood being impregnated with non-fluid oleoresin, which does not contribute towards the flow. The resin tapped is not only that which was deposited in the sapwood in former years, but also that which is formed during the years of tapping by the growth of the tree; hence, sufficient amounts of active cambium and young wood should be left untouched to permit a plentiful supply of water from the ground to maintain the foliage in vigor.

Various suggestions have been made to accomplish the collection of the resin in accordance with the conditions just mentioned, and at the same time prevent the waste which attends the American system as at present conducted. The Hugues system, as conducted in France, possesses many advantages, but the expense of adopting it in this country, and the fact that cups are required instead of boxes, have operated against it. The important advantages of the French system are that the chipping is more slowly and carefully conducted, that this chipped surface is only 3 to 5 inches in width, instead of 12 to 14 inches as with us, and that the products are collected by means of a lip or trough and a cup, in order to exclude pieces of bark and other foreign matter, and to reduce the loss by evaporation to a minimum.

At the recent Cotton States and International Exposition in Atlanta, an exhibit was made in the U. S. Division of Forestry, of a process patented by Mr. J. C. Schuler, by which no boxes are cut, but a cup of iron or earthenware was substituted. This process may be understood by reference to *Fig. 27*.

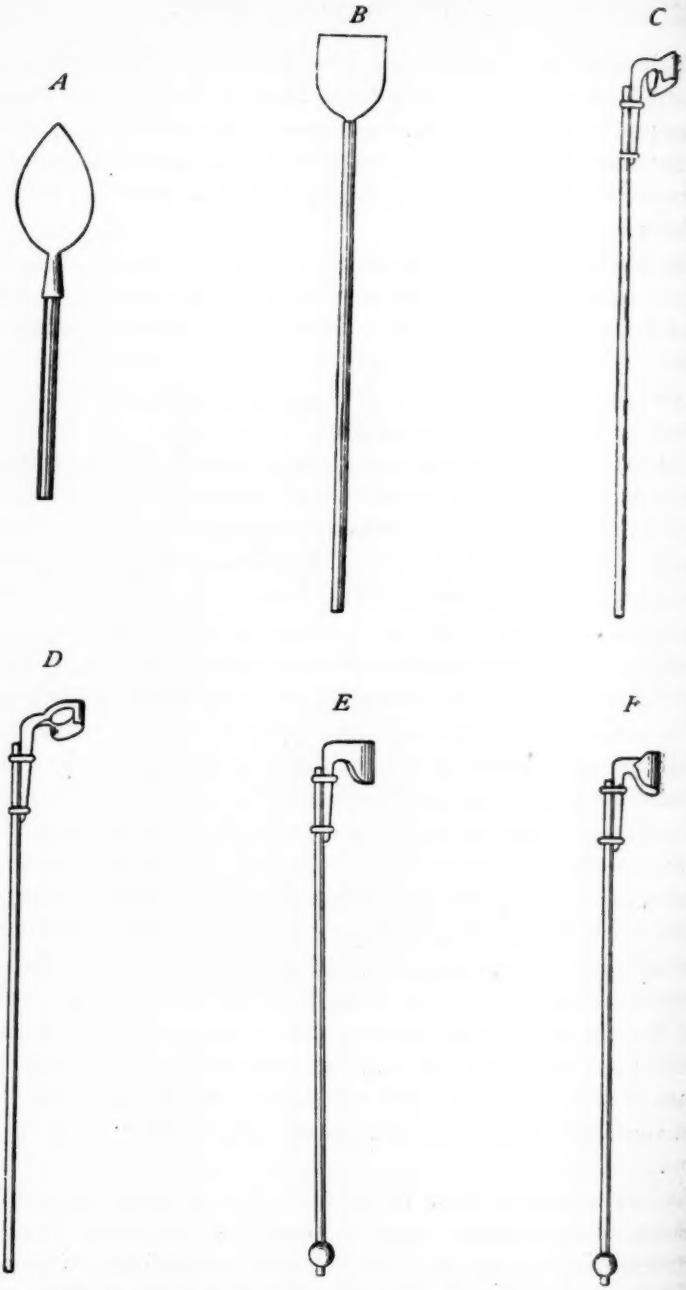


Fig. 26.—Tools used in turpentine orcharding: *A*, dipper; *B*, pusher; *C* and *D*, scrapers; *E*, closed hacker; *F*, open hacker.

The results claimed are a largely augmented yield and a much purer product. Conversation with a number of turpentine gatherers, however, indicated that they would not accept any system which involves the use of cups, since the first cost is not the only outlay, but the additional expense occasioned by wear and tear almost prohibits their use.

Dr. Charles Mohr, of Mobile, Ala., special agent for the U. S. Division of Forestry, has been inclined to look with favor on this process, although he confesses his inability to decide after only a

Fig. 27.—The first cut in the tree by the Schuler process.

season's observation of its working. The following is from a communication from Dr. Mohr concerning it:

"Schuler *admits* that the first cost for providing the cups, putting them up and removing them the second season, raises the expense of working a crop of 10,000 cups for two seasons to $460, against $190 for cutting 10,000 boxes, expended under the old system in working one crop for two seasons; all other expenses connected with the work being considered equal. On the other hand, Schuler *claims* that the difference is vastly overbalanced by the increased yield of crude turpentine obtained by his cup methods, amounting for one crop

worked two years to 195 barrels, at $3.50 per barrel; after deducting the extra expense involved by his method, this would leave a net balance of $410 per crop in favor of the cup system. He further claims that this amount is still further augmented if the larger quantity of spirit of turpentine and the higher quality of rosin obtained from the dippings under his system are taken into account. On the first point he says that fully one-eighth of the crude turpentine brought to the still from the boxes consists of chips, sand and other foreign matter, contaminations from which the product of the cups is entirely free. On the second point he refers to the high grades of rosin resulting from the distillation of the crude turpentine from the cups, which almost entirely classes with the highest and higher grades."

Apparently the question of systems resolves itself into one of boxes or cups. It is a matter against trouble and expense, and it is doubtful whether any other than the present system will be adopted until scarcity of material drives the producers into more economical methods.

The process of dipping the turpentine from the boxes has been described; these dippings are first collected in buckets, which are emptied into barrels in wagons and conveyed to the stills.

The distillation of turpentine is effected in copper stills set into brick furnaces. The still usually holds from fifteen to twenty barrels of the crude resin. With this "crude" a little water is added, and the whole is then warmed so as to allow the chips, straw and other light impurities to rise to the surface and be removed as far as possible. The top is then luted on and connected with a large condensing worm in a tank of cold water. When all the joints have been made tight, heat is applied strongly and the distillation commences. Water predominates in the first portions of the distillate, but soon a nearly pure oil is collected. In most cases water is run in during the process, in order to prevent the resin from becoming too thick and charring. The spirit of turpentine is dipped off from the surface of the water and run into barrels, or in some cases into oil tank cars. The residue in the still, while yet in a molten state, is run off by a faucet through three strainers of wire cloth, and then into barrels; this constitutes the commercial rosin. The rosin from the first year resin is rated in commerce as W. W. (water white) and W. G. (window glass). That from the second year's yield is classed N. M. K., etc.

The following facts concerning yield, taken from the U. S. Government Report, previously referred to, indicate just how the

products are classified; at the same time they show how enormously destructive the industry is at the present time:

"It appears that the yield of the crop of 200 acres distributes itself about as follows:

	Dip.	Scrape.	Total Crude Turp'ntine.	Total Yield.	Scrape.	Spirits.		Rosin.
	Pounds.	*Pounds.*	*Pounds.*	*Per Ct.*	*Per Ct.*	*Gallons*	*Per Ct.*	*Barrels.*
First year	67,200	16,800	84,000	30·9	20·0	2,100	34·4	260
Second year	54,000	28,800	82,800	30·5	34·8	2,000	32·8	200
Third year	28,800	24,000	52,800	19·5	45·5	1,100	18·0	100
Fourth year	28,000	24,000	52,000	19·1	46·1	900	14·8	100
Total	178,000	93,600	271,600	100·0	34·1	6,100	100·0	660

"If we assume that 4,500 trees produce these amounts in four years, the yield per tree in crude turpentine is about 60 pounds. The result at the still would indicate that each tree furnishes between 1¼ and 1½ gallons of spirit and ⅛ of a barrel, or 30 pounds, of rosin of better grade, or at best 75 cents' worth of product during the four years, which it has cost 55 cents to produce, leaving 5 cents net per tree per year, or from $1 to $1.25 per acre.

"From the fact that 4,000 acres of timber land (20 crops of 200 acres each) during four years' working produce 120,000 gallons of spirit of turpentine, or 7½ gallons per acre and year, it follows that to produce the 17,000,000 gallons reported as the annual product, not less than 2,250,000 acres must be in orchard; and since the yield of the first year represents 35 per cent. of the total annual yield, at least 800,000 acres of virgin forest are newly invaded annually to supply the turpentine stills in operation."

TAR.

Tar was one of the earliest pine products manufactured in the American colonies. In the South it was commonly converted into pitch before being shipped, by the addition of some crude turpentine and boiling down to the proper consistency. In the North considerable quantities were also produced from Pinus rigida.

Tar, as found and used in the United States, is the product of the incomplete combustion of the fat pine, Pinus palustris, and some other species of pine[1].

North Carolina produces most of the tar exported from this country, although small quantities, especially for home consump-

[1] Dunwody, AM. JOUR. PHARM., 1889, p. 600.

tion, are manufactured in South Carolina, Georgia and several other of the Southern States. Pharmacists and others who wish small quantities of tar for home consumption, wedge a number of small billets of the wood into an iron pot, ignite it and invert the whole over another iron pot, into which the tar drops and collects as the upper vessel becomes heated. Another method consists in placing a number of ignited billets at the top of an inclined plane of sheet iron; the tar runs down and is collected in a suitable vessel.

On a large scale, the wood is cut into lengths of 2 or 3 feet, split into billets, and arranged on end in a cavity in the earth, prepared so the bottom slopes to a gutter or to an iron trough or pipe. The upper ends of the billets are covered with bark and then with clay. A fire is built on top of the whole, using poor and decayed wood. When the whole becomes sufficiently heated, tar runs from the iron pipe or trough and is conveyed into suitable barrels. The annual output of tar in North Carolina, which produces the great bulk of this product, is not far from 60,000 barrels, valued at something over $1 per barrel.

[*To be continued.*]

A MENSTRUUM FOR FRESH KOLA NUTS.

By J. Henry Schroeder, Ph.G.

Ever since Mr. Kilmer read his interesting paper on kola, at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, in January,[1] many inquiries have been made regarding the best menstruum for exhausting kola. In order to obtain some light on this question, Prof. Frank G. Ryan, of the Philadelphia College of Pharmacy, has made extractions of the drug, with different menstrua, as follows:

I. 100 grammes of the fresh, red nuts were finely sliced, and extracted by macerating with 200 c.c. of alcohol and 2 c.c. of acetic acid, during four weeks. The product was reddish brown in color, and had the characteristic taste of fresh kola nuts, somewhat astringent.

II. 100 grammes of the fresh, white kola nuts, finely sliced, were extracted, as stated before, with 200 c.c. of diluted alcohol and 2 c.c. of acetic acid. The product was somewhat darker in color than

[1] See Am. Jour. Pharm., February, 1896, p. 96.

that extracted with strong alcohol, but had about the same physical properties.

III. 100 grammes of the red and white fresh kola nuts, finely sliced, were macerated during four weeks, with a menstruum of 160 c.c. alcohol, 40 c.c. glycerin, and 2 c.c. of acetic acid.

This preparation also had an astringent taste, characteristic of the kola nut. Upon standing for about a week, it showed signs of cloudiness, and deposited a slight sediment.

Duplicate assays of each of these preparations yielded the following amounts of total alkaloids for 100 c.c. of the preparation, equivalent to 50 grammes of drug.

I. 0·33, 0·36 } average . . . . . 0·345 grammes.

II. 0·43, 0·45 } average . . . . . 0·440 grammes.

III. 0·40, 0·37 } average . . . . . 0·385 grammes.

In order to determine whether hydrolysis would increase or decrease the yield of total alkaloids, a portion of I was hydrolized by heating in a reflux condenser, with 1 per cent. hydrochloric acid, during one-half hour. On assaying the product, I found it to yield 0·370 gramme of total alkaloids in 100 c.c., showing that the yield of alkaloids had not been affected by heating with an inorganic acid.

The above assay was conducted on 10 c.c. of the preparation, by Lloyd's method, and the figures represent the amount of purified alkaloids.

The chloroform extracts from the original preparation some fatty matter, and purification of the alkaloids had, therefore, to be resorted to.

It will be seen that diluted alcohol and 2 per cent. of acetic acid extracted the largest amount of total alkaloids.

In this connection it may be of interest to note Nathan L. Thompson's contribution to the AMERICAN JOURNAL OF PHARMACY, 1895, p. 518, wherein he reported that fresh kola nuts contain 56·65 per cent. of water and 0·75 per cent. of caffeine and theobromine, indicating that by Professor Ryan's processes the drug was completely exhausted of its total alkaloids. The taste and other characters of the marc indicated thorough exhaustion.

PHILADELPHIA, PA., April 14, 1896.

SOLUTION OF CITRO-PHOSPHATE OF SODIUM.

By William C. Wescott, Ph.G.

Sodium phosphate has long been known as a hepatic stimulant and purgative, when given in doses of 1 or 2 drachms; and within a year or so there have been placed on the pharmaceutical market of the United States several preparations which are stated to be solutions of sodium phosphate. One of these solutions is known as "Melachol," and its advertisement claims every fluid drachm of it to contain 85 grains of the combined sodium phosphate, citric acid and sodium nitrate. The other solutions are said to contain from 60 to 85 grains of sodium phosphate in each fluid drachm. The United States Pharmacopœia, in describing sodium phosphate, says: "when heated to about 40° C. the salt fuses, yielding a colorless liquid;" and it is well known that, on cooling, the liquid congeals to a crystalline mass. The official statement of solubility reads: "soluble in 5·8 parts of water at 15° C., and in somewhat less than 1·5 parts of boiling water;" and Mulder, in 1864, gave the solubility as 1 in 2·5 parts of water at 30° C.

Thus we see that these solutions are said to contain more sodium phosphate than could be kept in solution in water at ordinary temperatures, and that permanent liquefaction by heat is impossible. Therefore, if the sodium phosphate is the chief medicament and the other substances are of minor importance as medicinal agents, they must be used either to help make it possible to get so concentrated a solution of sodium phosphate, or to mask the alkaline taste of the latter, and thereby render it more acceptable. In order to ascertain whether such a concentrated solution of sodium phosphate could be prepared, the writer made some experiments with the three substances. He has found that 100 parts of sodium phosphate and 10 parts of citric acid, when shaken or triturated together, liquefy; that 100 parts of sodium phosphate and 5 parts of sodium nitrate under the foregoing conditions become semi-solid; and that 5 parts of sodium nitrate can be added to the liquid resulting from the mixing of the sodium phosphate and citric acid without causing it to solidify.

The solution that was found to correspond in specific gravity, acidity (titrated as citric acid) and amount of phosphoric anhydride to "Melachol," was the product of the following formula:

	Grammes.
Sodium phosphate, crystallized	100
Sodium nitrate	2
Citric acid	13

Triturate the substances until they liquefy, and add enough water to make 100 c.c. This liquid and also those prepared from other quantities of these materials retained their state of aggregation at ordinary temperatures, and even when cooled to 10° C., unless agitated; then small crystals separated. These crystals redissolved at 20° C.

ATLANTIC CITY, N. J., April 20, 1896.

[In the *Pharmaceutical Era* for April 9, 1896, John M. Tobin states that a solution of phosphate of sodium may be made so that each teaspoonful will contain between 75 and 85 grains of the salt by triturating in a warm mortar 5 parts of sodium "nitrite" crystals and 13 parts of "acid citric crystals" until liquid, and then adding 85 parts of granular sodium phosphate and triturating and shaking until a solution results.

Evidently an error has crept into Mr. Tobin's statement; because, according to our experience, citric acid will actively decompose sodium nitrite with evolution of red fumes. Sodium nitrate was undoubtedly intended.—*The Editor.*]

OPIUM ASSAYING.

BY LYMAN F. KEBLER.

Numerous and exhaustive as have been the investigations on the analysis of opium, yet the morphiologist is constantly encountering new difficulties in the course of his work. The status of the present official method in a measure contributes to these difficulties, in that it does not require the analyst to apply a correction to the crude morphine obtained by the prescribed process. This, undoubtedly, has left an unguarded avenue for the clever adulterator, and the writer has reasons to believe that it has been taken advantage of. It is well known that the same process will not yield equally pure morphine with the various kinds of opium met with in an analytical laboratory. Under these existing conditions embarrassing circumstances may arise, one analyst applying a correction while another neglects to do so.

A year ago the writer read a paper before the New York Section of the Society of Chemical Industry,[1] in which the several methods

[1] 1895, *J. Soc. Chem. Ind.*, 14, 464; abstr. AM. JOUR. PHARM., 67, 398.

for applying a correction to the crude morphine were briefly treated. Preference was then given to the ash method, but titration with volumetric acid solutions was also strongly advocated.

Dr. Dott,[1] in reviewing the subject of applying a correction, gave as his opinion that an adulterated opium could be detected by dividing the crude morphine into three parts, and estimating the impurity in one part by the ash method, treating a second part with barium hydroxide, while the third part is to be titrated with a volumetric acid solution. Such a procedure, undoubtedly, would be sufficient to determine the amount of pure morphine in a sample of the crude material; but is it practicable?

During the past year the writer has dealt with opium that was entirely different from the opium assayed the year previous. It contained the normal percentage of morphine, was very moist, and consecutively numbered cases yielded vastly different appearing morphine. One case might yield a very satisfactory white morphine, another a yellowish-white product, a third a dark-brown, while a fourth would be an intimate mixture of distinctively light-colored and dark-colored crystals of morphine. The opium had a very good appearance and was called "Turkey opium." The following data will serve to give the reader an idea of the opium:

No.	Per Cent. of Moisture.	Per Cent. of Morphine on Moist Basis.	Per Cent. of Morphine on Dry Basis
1	23·50	11·30	14·76
2	19·11	9·98	12·39
3	21·20	11·75	14·18
4	19·33	9·60	11·89
5	24·94	9·59	12·77
6	22·18	12·37	15·89

Some analysts are of the opinion that an experienced operator is able to judge whether a given sample of crude morphine needs to have a correction applied or not. This was also the writer's opinion until he met with the present opium. Dr. Squibb has diligently compared the relative merits of the lime-water process and the absolute alcohol method, with the conclusion in favor of the former. Below are given the results of a comparison of the ash method,

[1] 1896, *J. Soc. Chem. Ind.*, 15, 91.

lime-water process, and titration with a volumetric acid solution, using hæmatoxylin as indicator. The samples operated on were taken at random during the past year, from about 155 assays, and the results are as follows:

No.	Per Cent. of Ash.	Per Cent. of Impurity by the Ash Method.	Per Cent. of Impurity by the Lime-Water Process.	Per Cent. of Impurity per Titration with Volumetric Sulphuric Acid.
1	3·04	7·60	8·42	5·75
2	2·18	5·45	8·00	6·50
3	0·00	0·00	0·00	4·00
4	2·24	5·60	6·60	4·74
5	2·98	7·45	5·48	4·50
6	2·32	5·80	5·53	4·25
7	2·16	5·40	4·00	4·25
8	1·67	4·19	4·20	5·74
9	2·04	5·12	1·24	3·74
10	3·45	8·62	1·40	5·17
11	2·75	6·87	5·72	5·06
12	3·06	7·65	4·72	3·51
13	2·00	5·00	1·32	4·74
14	1·08	2·70	4·52	3·59
15	1·86	4·65	10·42	—
16	1·95	4·87	8·22	—
17	2·91	7·27	8·00	3·59

The above results indicate that the present methods of applying a correction are unsatisfactory. Nos. 1, 16 and 17 were the samples that were selected for morphine that would not need a correction, and yet they appear to contain the largest amount of impurity. No. 3 was a morphine that we obtained from denarcotized tincture of opium. Both the ash and the lime-water methods indicate it to be pure, while titration with acid indicates an impurity of at least 4 per cent. The sample contained considerable coloring matter, which was dissolved by the lime water, rendering it very dark. In a number of other cases the same results were obtained only in a less marked degree. It is not necessary to comment further on these results, since the careful observer can draw his own conclusions. The writer wishes only to call the reader's attention to the great difference between the ash and the lime-water methods in Nos. 9, 10 and 13. The presence of manganese was noted in the ash.

A THERMOMETRIC STIRRING ROD.

By Charles H. LaWall.

For some time past there has been in use, in the laboratory where the writer is engaged, a convenient form of stirring rod, which enables the worker to note the temperature of a liquid without the necessity of using a thermometer; or, to describe its functions more accurately, it is a tubular glass stirring rod, containing a compound of low melting point, which, by its fusion, indicates when the temperature of a liquid arrives at a certain point, above which it is not desired to have it proceed.

It is believed that a short description of the form and uses of this appliance would be welcomed by many to whom its use will soon become familiar, and, by calling the attention of others to a few of the advantages derived from its use, it may undergo improvements which will serve to widen its field of application and render it of greater value.

A Thermometric Stirring Rod.

The description of it is as follows: A common glass tube about 5·5 millimetres ($\frac{3}{16}$ inch) in diameter, outside measurement, and 18 centimetres (7 inches) long, is sealed by fusion in the flame of a Bunsen burner, and bent slightly as in the illustration. This is a convenient shape for a stirring rod, being especially adapted for removing the resinous deposits which sometimes adhere to the bottom of a capsule, as usually occurs in the assay of opium preparations.

Beeswax, paraffin or any other substance adapted to the requirements of the case, is then carefully adjusted to any desired melting point by the addition of a substance which raises or lowers the degree of temperature at which it melts. The tube is then filled about three-quarters full of the compound by rolling fragments be-

tween the fingers until they can be inserted into the open end of the tube, when a slight application of heat will melt the substance and cause it to run to the bottom.

The open end of the tube is then fused over a Bunsen burner until almost entirely closed, only a capillary orifice being allowed to remain, to permit the equalization of pressure. A subsequent verification as to its point of registration is accomplished by placing the rod in a beaker of cold water, accompanied by a thermometer, and gradually raising the temperature. The number of degrees indicated by the thermometer, at the moment when the compound assumes a liquid state, are noted as the point of registration.

The great range of its adaptability gives this rod a permanent place among the convenient forms of apparatus used for special purposes, for, by using the various kinds of paraffins and waxes, a range in temperature from 40° to 90° C. may be obtained.

In manufacturing the scaled iron salts, solid extracts and preparations of the same class, which require to be kept below a certain temperature during the process of evaporation it will be found of great benefit in the saving of time, as the operator can turn his attention to other duties, while, at the same time, he is easily enabled to note when the temperature reaches the point indicated by the rod, without being compelled to give it the close attention which the use of a thermometer requires in similar cases.

305 CHERRY STREET, PHILADELPHIA.

CAMPHOR LEAF OIL.[1]

BY DAVID HOOPER, F.C.S.

The recent high price of camphor, on account of the war between China and Japan, and trade monopolies, has caused some anxiety in countries where it is largely consumed; and China and Japan being at present the only two countries where camphor is produced on a large scale, it has been thought desirable that its cultivation should be taken up in other lands. In Japan the camphor trees grow at high elevations away from the sea, and only large trees of about 100 years old are selected for use in making the camphor. From the export returns of this country, it seems that the supply is gradually becoming exhausted. In the island of Formosa the camphor trees

[1] *Pharmaceutical Journal*, January 11, 1896.

are said to be by no means plentiful, and they grow only in certain favorable situations, as far as the climate is concerned, with savage tribes in the immediate vicinity. Here the trees are not considered worth taking until they are fifty years old, and the wood only of the roots and stems is subjected to distillation.

The camphor tree grows very well in India. The Calcutta Botanic Gardens possess a fine avenue of trees, which were introduced in 1802. It grows well in the Ootacamund Botanical Gardens and in other parts of the Nilgiris. It has been planted as an experimental measure, at Jhansi, in the Northwestern Provinces, and in other districts in the plains. Camphor has been known and used in India for many centuries. In A. D. 642, Indian princes sent camphor as a tribute or offering to the Chinese emperors. At one time the tree flourished in Nepal and Tipperah, a large tract of land lying between Bengal and the Upper Irrawaddy. Within the present century camphor was imported from Chittagong, but it has been said that the discovery by the hill-men of distilling it from the root led to the extinction of the trees.

In Ceylon the camphor tree grows well at elevations of 5,000 feet and less; it has the habit of a willow in the island, and it has been suggested that, like a willow, the trees should be coppiced, and the leaves and branches used for preparing the oil. The tree grows for ornamental purposes in Naples and other parts of Italy. Professor Maisch, in 1891, reported on the cultivation of camphor in Florida, where it flourished in almost any soil. The solid oil was made from the leaves and branches; the yield was 4 per cent., and the product was more like that of Japan, as it had an odor of safrol. California has lately become the scene of an industry which has for its objects the planting of the laurel camphor and the preparation of the oil for the American market. The tree has also become naturalized in Java, Brazil, Jamaica, and other isles of the West Indies, Mauritius and Madeira.

It is very evident that the camphor tree is able to grow very luxuriantly and extensively in the warmer, temperate and tropical parts of the world, far removed from China and Japan; but the slow growth of this tree would prevent all but large capitalists from opening up plantations and waiting for the plants to sufficiently mature. If it is true that in the island of Formosa the wood only of the larger trees is used, and the leaves and branches rejected, then there

can hardly be a scarcity of the trees, or the manufacture must be conducted in a very reckless and extravagant manner. The camphor from the Dryobalanops tree is said to be quite liquid if a young tree is tapped, and solid if the tree is old. Under such circumstances it would seem that the liquid oil constituted the first stage in the development of the solid substance. It is stated in some text-books on materia medica that the stearopten exists in every part of the plant, including the leaves. On the other hand, it is remarkable that the leaves are not used in China and Japan; perhaps the natives have found that the leaves only give a liquid product which cannot be profitably turned into camphor. As there is no definite information on this point to be found in any description of the industry, I thought it would be interesting to try the effect of distilling the leaves. Another reason that encouraged me to make some experiments in this direction, was the hearty manner in which some energetic planters of Ceylon have taken up the camphor question.

A large number of experiments have been made, and a great deal has been written with regard to camphor oil, the by-product obtained in refining crude camphor before it is formed into blocks. This has been proved to be a very variable liquid, with a specific gravity ranging from 0·88 to 1·00, an erratic optical rotation, although usually to the right, and containing camphor in suspension, or in solution, or none at all.

The first sample of leaves came from an umbrageous tree growing in the Government Gardens at Ootacamund. Fifty pounds of the leaves in a fresh state were distilled in a large copper still with sufficient water for six hours. Eight fluid ounces of oil were separated from the distillate, giving the yield of essential oil 1 per cent. The oil had a slightly yellow color, a specific gravity at 15° C. of 0·9322, and a rotation of + 9°·4 in a 2-decimetre tube. It gave off a small quantity of liquid at 160°, and began to boil regularly at 175°.

Collected below 180°	20·6
" " 185°	31·0
" " 190°	15·5
" " 195°	10·6
" " 200°	5·6
" " 205°	3·3
Residue	8·6
	95·2

The loss here was occasioned by some of the camphor congealing in the condenser; the amount, however, in this sample could only be about 10 or 15 per cent. The residue in the retort was quite solid in the cold, and had a yellowish color and strong camphoraceous odor.

The second sample was obtained from some younger trees grown at Naduvatam, on the Nilgiris, a district more than 1,000 feet lower than Ootacamund. The leaves were distilled in the same manner as in the previous experiment, but a large quantity of camphor condensed during the process and almost choked up the worm of the still. About 4 ounces of liquid were collected, having a mass of crystalline matter suspended in it. The oil was strained through cloth, and the solid matter, pressed hard to remove all the liquid portion, was left as a cake of camphor, weighing 2 ounces. The clear oil had a specific gravity of 0·9314 at 15° C., and twisted a ray of polarized light + 54° in a 2-decimetre tube. It began to boil regularly at 165°.

Collected below 185°	13·3
" " 190°	20·0
" " 195°	15·5
" " 200°	20·0
Residue	25·0
	93·8

The loss was again accounted for by some of the camphor condensing in the cool tube. About one-half of this oil consisted of solid camphor, or, calculating the camphor already separated, the oil from the Naduvatam leaves contained 75 per cent., which is a very satisfactory result. The camphor, dissolved in rectified spirit, twisted a ray of light + 30°. The altitude of the Government Gardens in Ootacamund is 7,300 feet, and it is possible that this elevation influences the formation of the solid stearopten in the leaves. At any rate, it is interesting to know that a large proportion of camphor can be obtained from the oil of the leaves themselves, and, probably, if taken from trees grown at a much lower elevation, a much larger proportion of this useful substance could be collected.

DRINK PLANTS OF THE NORTH AMERICAN INDIANS.[1]

By V. Havard.

These plants may be considered under three heads:

(1) Those yielding alcoholic liquors.

(2) Those yielding stimulating, exhilarating or intoxicating principles other than alcohol.

(3) Those furnishing juices, or, by infusion, pleasant beverages more or less used to quench thirst. The writer contends that the American Indians north of Mexico had not acquired the knowledge of preparing alcoholic drinks at the time of the landing of Columbus. In Mexico, from time immemorial, the abundant sap of the Maguey (Agave Americana) was fermented to form the national drink, pulque. While acquainted with fermentation, distillation was unknown to the Aztecs, this being an art introduced from Europe; hence, the Mexican liquor mescal, manufactured by distillation from baked, pounded and fermented heads of several species of agave is a product of a much later period. The Indians of Arizona and New Mexico knew how to prepare "mescal beer" from the heads of Agave Parryi and A. Palmeri.

From maize, both the Mexicans and the Peruvians produced a vinous liquor called chica. The cultivation of maize spread rapidly northward, and before the days of Columbus it was the principal crop of all the agricultural Indians, and it seems almost incomprehensible that the primitive and very simple art of making corn beer should never have found its way north of the Rio Grande.

For several generations, the Apaches of Arizona and New Mexico have prepared, from corn, an alcoholic drink which they called tizwin or tulpi. They probably obtained this knowledge from the Mexicans or Mexican Indians toward the end of the last or beginning of this century.

From the fruit of the Giant Cactus (Cereus giganteus, Engelm.) the Indians and Mexicans prepare a fermented liquor having the taste and smell of sour beer, although somewhat stronger. The larger and sweeter fruit of Cereus Thurberi, Engelm., of Sonora and Lower California, is used for the same purpose. According to Col. Cremony, "it is upon this liquor that the Pimos, Maricopas and

[1] Abstracted from the Bulletin of the Torrey Botanical Club, February, 1896, by George M. Beringer.

Yumas get drunk once a year, the revelry continuing for a week or two at a time, one-third of the party only indulging at a time, the remainder being required to take care of their stimulated comrades and protect them from injuring each other or being injured by other tribes."

The fruit of Opuntia Tuna, Mill., and O. Ficus-Indica, Haw., are used by Mexican Indians to make an intoxicating drink, called colonche, having a pink color and the taste of hard cider.

The fleshy fruit of several species of yucca are converted by the Chihuahua Indians into a fermented beverage, which is sometimes distilled by the Mexicans into indifferent aguardiente. The fruit of the Mezquite (Prosopis juliflora, DeC.) contains more than half its weight of nutritive principles, especially sugar in the proportion of 25 to 30 per cent. When cooked, pounded, mixed in water and strained, it yields a very nutritive and pleasant beverage called "atole;" this readily undergoes fermentation, whereby a kind of beer is produced, formerly much used by the Colorado and Gila River Indians. Plants yielding stimulating, exhilarating or intoxicating principles not intoxicating: the Anhalonium Engelmannii, Lem., a napiform, tuberculous cactus, 2 to 3 inches long, and hardly rising above ground, is called Peyote. Mexicans cut it into slices, which are kept dry for medicinal purposes, being commonly used in fevers. It is principally as an intoxicant, however, that it has become noted along the Mexican border, being eaten raw or added to native tizwin to make it stronger. It is said that the Indians or Mexicans partaking of this adulterated tizwin become temporarily crazy and uncontrollable. Closely allied to this is the Lophophora Williamsii, var. Lewinii, Coult. The "tops," under the name of Mescal Buttons, have been the subject of investigations. Lewin and Heffter found in them several alkaloids and at least two resinous substances, the latter being the active principles. An alcoholic extract, according to Lewin, produces in animals symptoms almost identical with those caused by strychnine, being, in small doses, a cardiac and respiratory stimulant. Drs. Prentiss and Morgan, of Washington, found that the chief physiological effect was the production of beautiful colored visions in an ever-changing and brilliant picture, being attended with wonder and admiration, but no merriment, delirium or intoxication. The Kiowa Indians were formerly much addicted to the use of this plant in their religious ceremonies. Each Indian chews

and swallows ten or twelve buttons at intervals between sundown and morning, and then sits quietly for a day or two enjoying the pleasurable effects of the drug.

The leaves and seed of Datura meteloides and the Mexican D. quercifolia are credited with deliriant properties. According to Bellanger the Indians near San Antonio formerly used the seed of Sophora secundiflora, Lag., as an intoxicant, half a bean producing "delirious exhilaration, followed by a sleep which lasts two or three days."

The most interesting plant of this class is doubtless Ilex Vomitoria, Ait., the Cassine or Yuoen of our Southern Indians. This was used by them long before the advent of the white man. It is likely enough that the Indians had several methods of preparing it; for purposes of conviviality making a weak decoction, but at religious festivals making it very strong and adding other ingredients, such as Button Snake root (Eryngium aquaticum) and Iris versicolor or Lobelia inflata, with the effect of imparting strong emetic properties, and they continued drinking and ejecting for one or two days, until they had sufficiently cleansed themselves.

Among the plants furnishing wholesome and palatable juices, the first place belongs to the maples. The Indians knew the value of the sap, they drank it and made sugar from it before the advent of the whites.

Box Elder (Acer Negundo, L.), our White Walnut (Juglans cinerea, L.), and most species of Birch (Betula), yield saccharine saps. In our Western deserts where water is scarce, Nature provides pulpy, juicy plants, from which Indians can quench their thirst. Chief among these are several species of Cactus. The succulent leaves and stem of such plants as Agave, Dasylirion Texanum and Yucca are similarly useful. The long, creeping stems of the Sand-Food (Ammobroma Sonoræ, Torr.,) are a palatable food and also a water substitute.

The mucilaginous seed of Salvia polystachya, Ort., known as Chia in Mexico, are roasted, powdered and thrown into water, and when sweetened and flavored, yield a very agreeable, wholesome and demulcent beverage.

The acidulous fruits of a number of species of Rhus were used to make the water more cooling and refreshing. In California the Manzanitas are used for the same purpose. The fruit of Shepherdia

argentea, Nutt., and S. Canadensis serve a similar use, and likewise the fruits of the Barberries.

For aromatic teas, Sassafras has always been appreciated. It is quite probable that the virtues of New Jersey tea (Ceanothus Americanus, L.), used extensively during the war for independence, had been indicated by the natives. Fragrant teas were also prepared from Spice-Bush (Lindera Benzoin, Blume) from wintergreen (Gaultheria procumbens), and sweet fern (Myrica asplenifolia), sweet golden rod (Solidago odora). Less acceptable must have been the infusions of Marsh Tea (Ledum palustre, L.) and Labrador Tea (L. Groenlandicum, Oeder).

Under the name of Encenilla or Chaparral Tea, the flowering tops of Croton corymbulosus, Engelm., is much used in Western Texas by Mexicans and Indians, as well as by our colored U. S. soldiers, who prefer it to coffee. It appears to be devoid of theine or other stimulating principle, except volatile oil. Other plants similarly used in the same country and Northern Mexico are: Bidens Bigelovii, Gray, Salvia ballotæflora, Benth., Hedeoma Drummondii, Benth., and Actinella odorata, Gray.

SOLANUM CAROLINENSE IN EPILEPSY.

The conclusions of Dr. Charles S. Potts on *Solanum Carolinense* in the treatment of epilepsy have been summarized in the *Therapeutic Gazette*, December 16, 1895, as follows:

(1) The drug has a decided influence for good upon the epileptic paroxysm.

(2) This influence is probably not so great or so sure as that obtained by the use of antipyrin and the bromides.

(3) In those cases in which it is of service, it relieves the paroxysms without causing other unpleasant symptoms, such as are sometimes caused by the use of large doses of the bromides.

(4) The dose ordinarily recommended (10 to 15 drops of the fluid extract) is too small; as much as a teaspoonful or more, four times a day, is often needed to secure results.

EDITORIAL.

THE SEVENTY-FIFTH ANNIVERSARY OF THE PHILADELPHIA COLLEGE OF PHARMACY.

The Philadelphia College of Pharmacy has passed her seventy-fifth milestone, and with renewed vigor is growing and advancing in the cause of pharmaceutical education.

The details of the entertainment by which this event was celebrated will be found on another page. It may be worth while, however, to note here some of the facts which were developed in the numerous able addresses by men representing widely different interests.

First, it was conclusively shown that this College is well and favorably known wherever pharmacy exists, but apparently least of all in the city of Philadelphia, the Mayor confessing to having only recently learned of the existence of this institution, although for a number of years he lived in its immediate vicinity.

The second subject upon which special stress was laid by several speakers was the magnitude of responsibility under which the pharmacist constantly labors. The slightest variation from the exactions of his profession, or the failure to discover and rectify the blunder of a physician, is sufficient to call down upon him the severest condemnation of the public without the formality of a hearing.

Finally, it was conceded on all sides that the Philadelphia College of Pharmacy has steadily risen from a small beginning, until now she stands among the foremost institutions of the world, and this without aid from the State or City in which she has been reared.

THE METRIC SYSTEM IN THE UNITED STATES.

In the March number of this JOURNAL we printed the Hurley Bill, designed to require the use of the metric system of weights and measures in this country. Since then, House Bill, No. 7,251, introduced by the Hon. C. W. Stone, has been substituted for the original bill.

The differences between the two are slight, but we print now the revised bill as follows :

A Bill to fix the standard of weights and measures by the adoption of the metric system of weights and measures.

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That from and after the first day of July, eighteen hundred and ninety-eight, all the Departments of the Government of the United States, in transaction of all business requiring the use of weight and measurement, except in completing the survey of the public lands, shall employ and use only the weights and measures of the metric system.

"SEC. 2. That from and after the first day of January, nineteen hundred and one, the metric system of weights and measures shall be the only legal system of weights and measures recognized in the United States.

"SEC. 3. That the metric system of weights and measures herein referred to is that in which the ultimate standard of mass or weight is the international kilogram of the International Bureau of Weights and Measures, established in accordance with the convention of May twentieth, eighteen hundred and seventy-five, and the ultimate standard of length is the international metre of the same bureau, the national prototypes of which are kilogram numbered twenty and metre numbered twenty-seven, preserved in the archives of the office of standard weights and measures.

"SEC. 4. That the tables in the schedules annexed to the bill authorizing the use of the

metric system of weights and measures, passed July twenty-eighth, eighteen hundred and sixty-six, shall be the tables of equivalents which may be lawfully used for computing, determining, and expressing the customary weights and measures in the weights and measures of the metric system."

This revised bill passed the House of Representatives by a vote of 119 to 117. By one of those mysterious influences which frequently prevail in legislative bodies, a motion to reconsider was made and carried. It was then referred back to the Committee on Coinage, Weights and Measures, so that now it is just where it was two months ago.

The exertions of those in favor of a rational system of weights and measures will now need to be redoubled, and everyone should write to his Representative at Washington requesting him to vote for H. R., No. 7,251. The Special Committee on Weights and Measures of the American Pharmaceutical Association, of which Professor Frank G. Ryan is chairman, is taking active steps to have all the State Pharmaceutical Associations adopt resolutions favoring the passage of this bill. It is evident that some pharmacists are opposed to the bill simply because they are ignorant of what the results of favorable action would be. They appear to think that every weight and measure would have to be calculated into the metric system, not realizing that it is as easy to use a set of metric weights as any other, and that not nearly so many conversions of weights by calculation would be necessary as now.

It is only a question of time when the whole world will use the metric system. Will the United States be the last to fall into line?

PENNSYLVANIA PHARMACEUTICAL ASSOCIATION.

The following notice will interest many pharmacists of this State:

The Pennsylvania Pharmaceutical Association will hold its nineteenth annual meeting at the Holly Inn, Mt. Holly Springs, Cumberland County, on the 16th, 17th and 18th of June next. The change has been made from the Gettysburg Springs Hotel, which will not be opened this season.

J. A. MILLER, *Secretary.*

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

THE NATIONAL FORMULARY OF UNOFFICIAL PREPARATIONS. Revised edition. By authority of the American Pharmaceutical Association, 1896.

Next to the Pharmacopœia, the National Formulary holds the most important place among the every-day books of the pharmacist. The present edition bids fair to maintain this position, for, under the chairmanship of Professor Diehl, the Committee have produced a book which well deserves the attention it will get from every practical pharmacist in the land.

No doubt there are many unofficial formulas in existence which are not found in its pages, but the members of the Committee have done the best they could, and they are deserving of great praise. Their reasons for declining to recognize the demands for some formulas are set forth in the preface, as follows:

The demand for additional formulas has been carefully considered by the Committee. This demand, unfortunately, was in most cases for working formulas for preparations which have come into current use under fanciful trade names, and for which no formulas, other than obscure indications of composition borne on the labels, are known to pharmacy. The Committee did not consider it within the scope of their duties to devise and construct formulas for

such preparations, the more particularly since their composition is only imperfectly given, and because the demand for them seems to be dependent upon the skill and industry with which they are brought to the attention of the medical profession, rather than upon any intrinsic superiority that they possess over the medicinal agents.

The change to the metric system is a step in the right direction.

Every pharmacist should have this book and use it; at the same time he will confer a lasting benefit on the public, and advance his own interests if he will persuade physicians to prescribe its preparations, and thereby remove the necessity for the use of the fanciful trade-marked and otherwise protected preparations which the Formulary Committee have seen fit to so severely score in the language just quoted.

DIE OBLITO-SCHIZOGENEN SECRETBEHÄLTER DER MYRTACEEN. Von Gotthilf Lutz, Apotheker. An inaugural dissertation presented to the Faculty of the University of Bern, for the degree of Doctor of Philosophy.

UNTERSUCHUNGEN ÜBER DIE SEKRETE. Mitgeteilt von A. Tschirch.

15 UEBER DAS AMMONIACUM. Von H. Luz. Reprinted from *Archiv der Pharmacie*, 233, 7 und 8 Heft, 1895. An interesting and valuable contribution to the chemistry and botany of this gum resin.

16 BEITRÄGE ZUR MIKROSKOPISCHEN KENNTNISS DES OPIUMS. Von Dr. Mjöen. Reprinted from *Archiv der Pharmacie*, 233, 7 Heft, 1895.

UEBER BAU UND NERVATUR DER BLATTZÄHNE UND BLATTSPITZEN MIT RÜCKSICHT AUF DIAGNOSTISCHE ZWECKE IM GEBIETE DER PHARMAKOGNOSIE. Von Hans Virchow. Reprinted from *Archiv der Pharmacie*, 234, Heft, 2 1896.

UNTERSUCHUNG ÜBER DIE BLATTFARBSTOFFE UND DIE BEZIEHUNGEN DES CHLOROPHYLLS ZUM BLUTFARBSTOFF. Von A. Tschirch. *Résumé* from *Schweiz. Wochenschrift für Chemie und Pharmacie*, 1896, No. 10.

WAS IST EIGENTLICH PHARMACOGNOSIE? Von A. Tschirch. Reprint from *Zeit. des Allgem. österr. Apotheker-Vereines*, 1896, No. 3.

NOTIZ ÜBER DIE WURZEL VON RUMEX NEPALENSIS. Von O. Hesse. Reprint from *Berichte der deut. chem. Gesellschaft.*

ZUR GESCHICHTE DES PROTEACINS. Von O. Hesse. Reprint from Liebig's *Annalen der Chemie*. 290 Band, 1896.

ZUR PRÜFUNG DES CHININSULFATS. Von O. Hesse. Reprint from *Archiv der Pharmacie*, 234, Heft 3, 1896.

THE PURPOSES OF ETHNO-BOTANY. By J. W. Harshberger. A lecture delivered before the University Archæological Association, December 4, 1895, and reprinted from *Botanical Gazette*, 21, 146.

ANNUAL REPORT ON THE YEAR 1895. E. Merck, Darmstadt. Published in March, 1896.

The 137 pages of this report are full of interesting matter, as usual. The first twenty-eight pages are devoted to original communications, and the balance to preparations.

FOREST FIRE LEGISLATION IN THE UNITED STATES. Circular No. 13, U. S. Department of Agriculture, Division of Forestry. B. E. Fernow, Chief.

FACTS AND FIGURES REGARDING OUR FOREST RESOURCES BRIEFLY STATED. U. S. Department of Agriculture, Division of Forestry. B. E. Fernow, Chief.

SEVENTEENTH SEMI-ANNUAL DIVIDEND MEETING OF THE EMPLOYEES OF THE PROCTER & GAMBLE COMPANY, IVORYDALE, O., containing an address on "The Relation of Capital and Labor," by Washington Gladden, D.D., and one on "Higher Citizenship," by Hon. Benjamin Butterworth.

UEBER REINDARSTELLUNG DER GÄHRUNGSMILCHSÄURE, mit Einleitenden Versuchen über Destillationen in Vakuum der Quecksilberluftpumpe. Dissertation von Wilhelm A. Dijes, Dr. Phil. Hildesheim, 1895. Pp. 44.

HOW TO MAKE TABLETS. By Frank Edel. Spatula Publishing Company, 8 Oliver Street, Boston, Mass.

THE JACK RABBITS OF THE UNITED STATES. By T. S. Palmer, M.D., Assistant Chief of Division of Ornithology and Mammalogy, U. S. Department of Agriculture. 1896.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, April 21, 1896.

The seventh regular Pharmaceutical Meeting was held in the Chemical Lecture Room of the College at 3 o'clock.

Mr. F. W. E. Stedem was chosen chairman, and the reading of the minutes of the previous meeting was dispensed with.

The first paper, on "Opium Assaying," was read by Mr. Chas. H. LaWall, in the absence of the author, Mr. Lyman F. Kebler. (See page 257.) After numerous experiments, Mr. Kebler is convinced of the necessity of making corrections for the impurities in the crude morphine obtained by assay, and for this purpose he employed the ash, titration and lime-water processes, obtaining results which would hardly warrant a comparison of these methods.

Mr. J. Henry Schroeder, of Cincinnati, O., contributed a paper entitled "A Menstruum for the Extraction of Kola," which was read by Professor Trimble. (See page 254.) At a recent Pharmaceutical Meeting, samples of fresh kola nuts were presented by Mr. Fred. B. Kilmer (AM. JOUR. PHARM., 1896, p. 118), and in response to inquiries from druggists for a menstruum for this drug, Prof. F. G. Ryan made several extractions of these samples in their fresh state. These were assayed by Mr. Schroeder, and in comparing his results, diluted alcohol acidified with acetic acid was shown to be the best solvent for the extraction of the alkaloids. Samples of the extracts made by Professor Ryan accompanied the paper.

Professor Trimble stated that the yield of alkaloid after treatment of one of the samples with acid, to effect hydrolysis of the glucoside, was no greater than that yielded previous to this operation.

The next paper was on "Solution of Citro-Phosphate of Sodium," by Mr. W. C. Wescott. (See page 256.) This preparation is similar to the commercial article known as "melachol," and answers the demand by physicians for a solution of sodium phosphate containing 60 grains of the salt in 1 fluid drachm. Accompanying the paper were samples of solutions containing the constituents in varying proportions, so as to liquefy; but the one which seems to be

most satisfactory in taste and general appearance has the following formula: Sodium nitrate, 2 grammes; citric acid, 13 grammes; sodium phosphate, 100 grammes; and sufficient water to measure 100 cubic centimetres.

Professor Trimble called attention to a serious error in a formula published recently in one of the drug journals, where *nitrite* of sodium was directed. This, when brought into contact with the other constituents, is decomposed with evolution of red fumes.

Mr. Chas. H. LaWall presented the last paper, which was entitled "A Thermometric Stirring Rod." (See page 260). This instrument serves the double purpose of stirring rod and thermometer, and where it can be utilized has the advantage over the latter in requiring less careful watching. It consists simply of a piece of glass tubing closed at one end by fusion and partly filled with a mixture of paraffin, wax and other substances, in proportions varying so that the melting point of the contents of the rod will indicate the temperature. These rods can be made so that they will individually indicate temperatures ranging from 40° C. to 90° C. Samples of them were exhibited.

On motion, the meeting adjourned.

THOS. S. WIEGAND,
Registrar.

EXAMINATION QUESTIONS OF THE PHILADELPHIA COLLEGE OF PHARMACY, 1895-6.

FIRST YEAR EXAMINATION.

PHARMACY.

A—Percolation. (1) Define its principle of action. (2) What are the advantages of previous maceration? (3) How may the exhaustion of the drug be determined? (4) How may the alcohol remaining in an exhausted drug be economically recovered? (5) Name two methods of regulating the flow of the percolate. (6) What is repercolation? Describe its advantages.

B—Solvents and Menstrua. (1) What solvent is most frequently used in pharmacy? (2) Name five solvents in the order of their importance, stating the class of substances for which each solvent is adapted. (3) In what respects does a solution differ from a percolate? (4) Define simple solution, compound solution, chemical solution, menstruum, diluent, macerate, marc.

CHEMISTRY.

C—(1) Give the formula of a haloid acid, and of an oxygen acid, and explain the difference between them. (2) What is meant by the basicity of an acid? Illustrate by examples. (3) Explain the difference between a neutral and an acid salt, and illustrate by examples.

D—(1) Write the reactions for the production of hydrogen sulphide, and the production of nitric acid. (2) Complete the reactions:

$$MnO_2 + 4HCl =$$
$$Na_2S_2O_3 + H_2SO_4 =$$
$$Ca_3(PO_4)_2 + 2H_2SO_4 =.$$

BOTANY.

E—Structure. (1) What are the two most important uses of the root? (2) Name three other ways in which some roots may be useful to the plant. (3)

State how a thalloid shoot differs from an ordinary shoot. (4) As respects their position or insertion, into what different kinds may buds be divided? (5) Draw a leaf which answers the following description: Petiolate, stipulate, simple, spatulate, base, acute, apex emarginate, margin entire. (6) On what numerical plans, respectively, are most monocotyls and dicotyls constructed? (7) Define briefly each of the following kinds of pistils: gymnospermous, angiospermous, syncarpous and apocarpous.

F—Classification. (8) Name the four primary divisions of the plant subkingdom, and give examples of common plant species that illustrate each. (9) In which of these divisions is the gametophyte the more prominent form? (10) In which of these divisions do we find plants producing both microspores and macrospores? (11) Name two of the most important distinctions between gymnosperms and angiosperms. (12) In a seed, what part or parts represent the sporophyte, and what part or parts the gametophyte?

COMMITTEE.

G—Iodine. (1) Describe its physical appearance. (2) Give the principal commercial sources of Iodine. (3) Give a brief description of one method of manufacturing Iodine. (4) What is the specific gravity of Iodine? (5) Give a test for the presence of Iodine in a solution. (6) Give an antidote for poisoning by Iodine.

H—Heat. (1) What is the effect of heat upon solids? (2) What is its effect upon liquids? (3) Name the instrument usually employed for measuring degrees of heat. (4) What three scales are in common use? (5) Which of these scales are recognized by the United States Pharmacopœia? (6) How many degrees are included between the freezing and boiling points of water in each scale? (7) How can the degrees of one of these scales be converted into those of another? Give an example. (8) Why does a Bunsen burner give a blue flame?

I—(1) Which is best for cleaning a greasy bottle, an acid or an alkali? And why? (2) How would you determine the correctness of an ounce graduated measure? (3) How could you clean a bottle stained with tincture of chloride of iron? (4) What implement is used at the prescription counter for the process of trituration? (5) Draw a section of the shape best adapted to this use.

K—(1) How many c.c. of water would be displaced by a block of stone, 2 metres long, 2 centimetres wide, and 280 millimetres thick, if completely immersed? (2) How many grammes of official alcohol, sp. gr. 820, would the same stone displace?

SENIOR EXAMINATION.

THEORY AND PRACTICE OF PHARMACY.

Put down on this paper all of the figures used in making your calculations.

A—(1) How many grammes are there in a pint of each of the following official liquids? *a.* Glycerin. *b.* Alcohol. *c.* Water. *d.* Acetic Acid. *e.* Chloroform. (2) If a body weighs 100 grammes when immersed in official glycerin, how much will it weigh if immersed in each of the following official liquids? *a.* Diluted Alcohol. *b.* Alcohol. *c.* Water. *d.* Acetic Acid. *e.* Chloroform.

B—Give the Synonym or Common Name; Unabbreviated Official or Latin Name; Ingredients in Preparing; Brief Outline of Process; Describe the

Appearance of—Burnt Alum, Plaster of Paris, White Precipitate, Diachylon Plaster, Blaud's Pills, Liver of Sulphur, Blistering Collodion and Volatile Liniment.

C—Give the Official Name; English Name; Ingredients; Brief Outline of Process; Describe the Appearance of—Infusum Digitalis, Extractum Calumbæ Fluidum, Oleum Terebinthinæ Rectificatum, Syrupus Krameriæ, Spiritus Myrciæ, Mistura Rhei et Sodæ, Extractum Colocynthidis Compositum and Resina Jalapæ.

D—(1) What is Ethyl Nitrite? (2) How is it prepared? (3) What are its uses? (4) How is it preserved from change? (5) What is Amyl Nitrite? (6) How is it prepared? (7) What are its uses? (8) How is it administered? (9) How is it preserved from change?

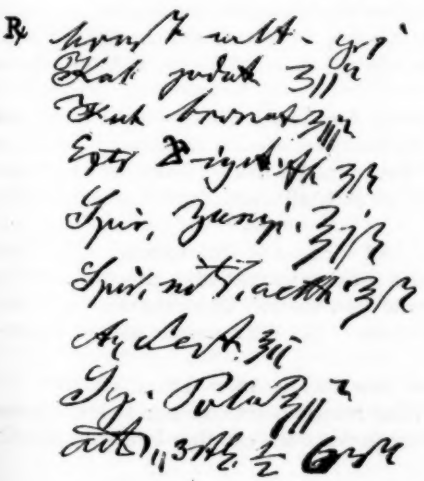
E—(1) How is Ether prepared? (2) What is its specific gravity? (3) What are its uses? (4) Name the usual impurities. (5) How may they be detected? (6) Is the vapor of Ether heavier or lighter than air? (7) What precautions are necessary in handling Ether?

F—Name five color tests for active principles which yield a red color with sulphuric acid or nitric acid. State what differences are noticed in the appearance of each liquid resulting from an application of each test.

G—Explain three methods of writing Metric prescriptions; illustrate each by an example, showing whatever advantages or disadvantages there may be in either.

H—(1) How is Wafer-paper prepared? (2) What are its properties? (3) What is the most convenient method for using Wafer-paper in flat discs in administering medicines? (4) State minutely how bitter or nauseous powders are enveloped by the use of Wafer-paper (not in flat discs). (5) Illustrate the above, if you choose, by drawing sketches.

I—Criticise and translate the following prescriptions. Write out the English names of each ingredient, with quantities. State how you would compound each; and if any incompatibility would be developed in either, state what it is, and what would be the proper procedure.



K—Criticise and translate the following prescriptions. Write out with English names the ingredients and quantities. State whether you would compound them as written, or what course you would pursue upon receiving them.

℞ Bismuthi Subnit 3i
Sodii Bicarb gr XXX
Mft pil No XX
S. Take One After
Each Meal
83291 3.16.1883 E.

℞ Quin. bisulph 3ß
Ext Eucalypt ℥ßi
Aqua
Syr. a teaspoonful 1/2 ij

CHEMISTRY.

A—(1) What is the percentage composition of *Aqua Ammoniæ*, of *Aqua Ammoniæ Fortior*, and of *Spiritus Ammoniæ?* (2) Describe the preparation of these substances. (3) Give the chemical formulas for *Ammonii Chloridum*, *Ammonii Iodidum*, and *Ammonii Carbonas*. (4) What are the commercial sources of Ammonia and its salts?

B—(1) Give the formula, appearance and properties of *Calcii Chloridum*. (2) Give the formula, appearance and properties of *Calx Chlorata*. (3) How is this latter substance made, and what are its pharmaceutical and technical uses? (4) What is the common name of *Calcii Sulphas Exsiccatus*, and what is the material (common name) from which it is prepared?

C—(1) Describe the metal Aluminum and state its uses. (2) Mention the sources and methods by which it is obtained at present. (3) Give the formulas of *Aluminii Hydras* and of *Alumen*, and describe each of these.

D—(1) What is the chief ore of Mercury, and what is the same substance called when made artificially? (2) Give the formulas and names (common and official) of the several oxides of Mercury. (3) What is the composition of "Turpeth Mineral?" (4) Give the correct chemical name and formula of *Hydrargyrum Ammoniatum*.

E—(1) Describe the several oxides of Lead, and give their formulas and common names. (2) Mention the practical uses of each of these. (3) What is the composition of "White Lead," what of "Red Lead," and what of "Sugar of Lead?" (4) Give a distinctive test for each of these. (5) What is Goulard's Solution, and how is it made?

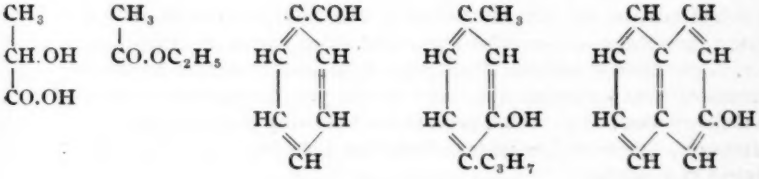
F—(1) What is the chemical name and formula of Chloroform? (2) Write the reaction for its production by the usual manufacturing process. (3) By what physical and chemical tests would you identify Chloroform? (4) What are the pharmacopœial tests for its purity? (5) What are the uses of Chloroform in medicine and pharmacy?

G—(1) What is an Aldehyde, and how does it differ from a Ketone? (2) Give an example of each class. (3) What reactions are common to both classes of compounds? (4) By what difference in reactions can they be distinguished?

H—(1) To what classes of carbohydrates do Glucose, Cane-Sugar, Invert-Sugar, Milk-Sugar, Dextrin and Maltose respectively belong? (2) State the reactions most characteristic of each of these. (3) How many of these are directly fermentable with yeast, and how many only indirectly? (4) If the latter, write the reactions whereby they become fermentable.

I—(1) Describe *Acidum Benzoicum*, and state by what physical and chemical tests it can be identified. (2) Write the reaction for its artificial production. (3) Describe *Acidum Salicylicum*, and state by what physical and chemical tests it can be recognized. (4) Write the reaction for its artificial production. (5) Show by graphic formulas the relation of these two acids to each other.

K—Write the full chemical name and the official designation for the following compounds:



MATERIA MEDICA AND BOTANY.

I—Botany. (1) State the distinction between an energid and a cell. (2) Define a cœnocyte. (3) Define a syncyte. (4) State a means by which cellulose may be distinguished from related substances. (5) How would you distinguish a leucoplast from an inulin grain? (6) Define the terms amyloplasts and chloroplasts. (7) What are enzymes? Name two examples of enzymes which occur in plants. (8) Name three vegetable carbohydrates. (9) How does a false tissue differ from a true tissue? (10) Name three tissues which are parenchymatous, and three which are prosenchymatous. (11) Name a tissue which is syncytic and another which is cœnocytic. (12) How does a schizogenous intercellular space differ from a lysigenous one? (13) In what groups of plants respectively should we look for monostelic, polystelic and schizostelic stems? (14) In what organ or organs of the higher plant should we expect to find separate phloem and xylem bundles? (15) In the stems of what plants should we expect to find closed collateral bundles?

II—Materia Medica. (16) Which of the following groups of plants furnish official root-drugs: Algæ, Fungi, Lichenes, Mosses, Ferns, Gymnosperms, Dicotyls and Monocotyls? (17) Write the names of two official root-drugs used in medicine chiefly as alteratives. (18) Write the names of two glucosidal root-drugs which are official. (19) Write the names of two official root-drugs which abound in secretion reservoirs containing resin. (20) Write the name of one official root-drug that contains bast-fibres, and of one that contains none. (21) Write the names of two official root-drugs that are narcotic poisons. (22) Write the official names of two rhizome drugs whose bundles are closed and scattered. (23) Write the official name of a rhizome drug whose bundles are chiefly arranged in a circle and are each enclosed in an endodermis. (24) Write the official names of two rhizome drugs that are powerful hepatic stimu-

lants. (25) Write the official names of two rhizome drugs derived from the Liliaceæ. (26) Write the names of the most important medicinal constituent of each of the following drugs: Ipecac, Hydrastis, Geranium. (27) Name two official bark drugs which are destitute of bast fibres. (28) Name an emetic drug which produces emesis by acting on the vomiting centre in the medulla. (29) Name an emetic which produces its effects by direct action upon the stomach. (30) Name an alkaloidal drug which is powerfully sialogogue and sudorific, and at the same time depresses the heart's action. (31) Name two official drugs, one of which, in moderate dose, tones the heart and slows its beats, and the other of which depresses it and slows its beats. (32) Define a cholagogue drug and name one. (33) Name two official drugs which are both narcotic and mydriatic. (34) In case of poisoning by tobacco, what antidote would be suitable after evacuating the stomach? (35) Why is atropine so frequently administered in cases of opium poisoning? (36) Name two drugs each of which stimulates the muscular coats of the smaller arteries, reducing their calibre. (37) Name a powerful alkaloidal drug which is anti-sudorific in its action. (38) How would you distinguish Logwood from Red Saunders? (39) By means of what structural difference would you distinguish Dandelion root from Chicory root? (40) What parts of the following plants are official: Datura Stramonium, Quercus Lusitanica, Humulus Lupulus, Canadian Hemp, and Anamirta Paniculata?

COMMITTEE.

A—Show all figures used in obtaining your answers to these questions. (1) An apothecary has two lots of Powdered Opium of the respective morphine strengths of 12 per cent. and 16 per cent. How much of each must he take to make 4500 c.c. of official Tincture of Opium if he desires to use Powdered Opium of the average morphine strength of the Pharmacopœia? (2) How many c.c. of Camphorated Tincture of Opium would an equal weight of Powdered Opium make? (3) About how much official Extract of Opium could be made from the same weight of Powdered Opium? (4) How many milligrammes of water would weigh exactly as much as a litre of Official Alcohol, temperature not considered?

B—Acetic Acid. (1) Give its chemical formula. (2) How is the commercial product manufactured? (3) How may it be made from Ethyl Alcohol? (4) Name the official Acetic Acids and give the percentage of Absolute Acid in each. (5) How would you prove the presence of Acetic Acid in an aqueous solution of an Acetate of an inorganic base? (6) Define the class of preparations called Vinegars. (7) Give the unabbreviated Latin titles of the official Vinegars. (8) Give the ingredients in each. (9) Give an official process for Spirit of Mindererus. (10) What do you regard as the maximum dose of the Morphine Salt of Acetic Acid?

C—(1) Write the official names of three important drugs of North American origin, and name an important medicinal constituent of each. (2) Name an official bitter-tonic drug that is destitute of tannic matters, and whose fluid preparations, therefore, do not form a precipitate with ferric solutions. (3) Name two official barks distinguished from all others by being colored a deep red by a solution of one of the caustic alkalis. (4) Name three official root-

drugs which are destitute of starch. (5) Write the official names of two root-drugs which contain laticiferous tissue.

D—Wild Cherry. (1) Give its official name. (2) Botanical origin. (3) Natural order. (4) Habitat. (5) Describe Wild Cherry Bark. (6) Name its official preparations. (7) Give brief outline of the formulas for each. (8) What is the active constituent formed during the processes for these preparations? (9) Explain how this constituent is formed. (10) Give the dose of the strongest preparation of Wild Cherry.

E—Salicylic Acid. (1) Name three official liquids containing Salicylic Acid in combination. (2) Give a process for obtaining Salicylic Acid from one of these liquids. (3) To what is the alleged superiority of Salicylic Acid obtained from a natural source over that made from carbolic acid attributed? (4) What ordinarily causes the discoloration of solutions of Salicylates? (5) What are the dose and medical properties of Salicylic Acid?

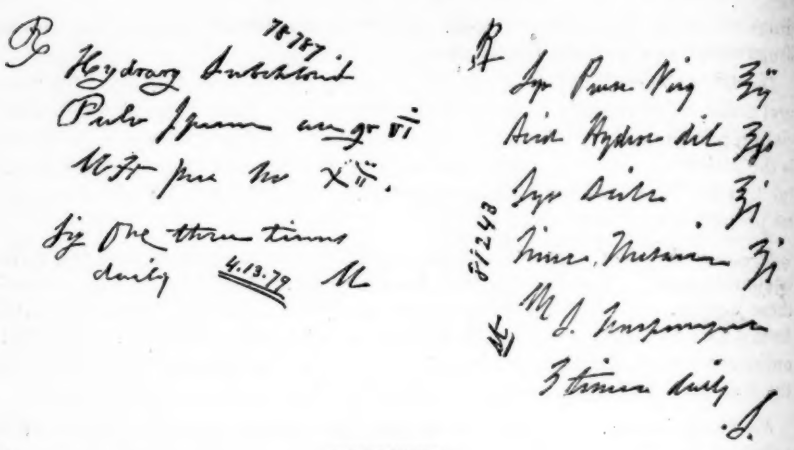
F—Precipitation. (1) What is usually the cause of precipitation in fluid extracts? (2) How would you prove that the precipitate should be filtered out? (3) In the following cases, state whether the liquid should be filtered before dispensing, and why. Oleoresina Cubebæ? Oleoresina Aspidii? Oleoresina Piperis? (4) Should filtration be resorted to before dispensing the following mixtures: Fluid Extract of Lupulin 25 c.c., Cinnamon Water 50 c.c.? Potass. Chlor. ℥iii; Tr. Ferri Chlor. ℥ij; Glycerin, ℥ss.; Aqua. ad ℥iii. (5) Under what circumstances would Tincture Iodine 1 part, and Water 2 parts, mix without precipitation?

G—(1) Give two characteristic tests for Salts of Bismuth. (2) What acid is used to dissolve Metallic Bismuth? (3) Give three tests to distinguish between Salts of Lead and Bismuth. (4) Name four metals the salts of which are liable to contaminate those of Bismuth.

H—Powdered Opium. (1) Name the most important alkaloid which official Powdered Opium contains, and state the percentage of it that should be present. (2) At what temperature should Opium be dried when reducing it to powder? (3) Of what degree of fineness should the official powder be? (4) How would you reduce Powdered Opium of a high percentage of alkaloid to the official standard? (5) Give the official and common names of six preparations in which Powdered Opium is used.

I—Give the English name, botanical name of plant, natural order, habitat, and active principle of each of the following drugs: Pilocarpus. Cannabis Indica. Jalapa. Coriandrum. Myristica.

K—(1) Criticise and translate the following prescriptions, write out with English names ingredients and quantities, state whether you would compound them as written or what course you would pursue on receiving them.



SPECIMENS.

The following specimens were placed before the senior students for recognition during the several examinations:

Pharmacy.

Aqua chloroformi,
Syrupus zingiberis,
Syrupus acidi hydriodici,
Extractum cinchonæ fluidum,
Extractum sennæ fluidum,
Confectio rosæ,
Pulvis rhei compositus,
Adeps lanæ hydrosus,
Tinctura cardamomi composita,
Tinctura calumbæ.

Chemistry.

Aqua chlori,
Acetanilidum,
Sodii bicarbonas,
Potassii bromidum,
Ammonii chloridum,
Potassii ferrocyanidum,
Plumbi oxidum,
Potassii bitartras,
Sodii acetas,
Acidum sulphurosum.

Materia Medica.

Stillingia,
Aconitum,
Caulophyllum,
Rubus,
Euonymus,
Cascarilla,
Santalum rubrum,
Eriodictyon,
Absinthium,
Strophanthus.

Committee.

Aqua fœniculi,
Infusum digitalis,
Syrupus tolutanus,
Tinctura gentianæ composita,
Prunus Virginiana,
Granatum,
Buchu,
Acidum boricum,
Acidum tannicum,
Potassii ferricyanidum.

OPERATIVE PHARMACY.

(*1*) *Alcoholmetrical Test.*

Estimate the amount of alcohol in the sample of white wine; put all calculations on the sheet of paper, with your name and examination number, and put clearly on the label the letter of the sample estimated.

(2) *Bacilli.*

Powd. Ext. of Glycyrrhiza . . . . . 7·0 gm.
" Acacia . . . . . 1·0 gm.
" Sugar . . . . . 4·0 gm.
Syrup of Tolu . . . . . q. s. . . . . .

Mix; make 15 Bacilli. Put in a paper box.

(3) *Emulsion.*

Make 100 c.c. of an emulsion which shall contain 50 per cent. of cod liver oil, by the *English method;* put in a bottle and place a label on the bottle, giving the proportions of each ingredient.

(4) *Capsules.*

Cinchonine Sulph . . . . . 1·80 gm.
Powd. Capsicum . . . . . ·50 gm.

Mix; fill into one dozen gelatin capsules.

N. B.—Empty capsules will be found in the round box.

(5) *Plaster.*

Spread a warming plaster for the side (shaped, with round corners), about 4 x 6 inches of plaster surface.

ANALYTICAL CHEMISTRY.

The examination in this branch consisted in the analysis of a mixture of from three to five salts or compounds in the form of powder. Each student was given two hours in which to carry out this work.

MICROSCOPY.

Make a sufficient number of sections, transverse, longitudinal-radial and longitudinal-tangential, of the specimen given you for study, and use such clearing agents, test solutions and stains as are necessary to determine the following points:

(1) Is the specimen derived from the pteridophyta, from the gymnosperms, from the monocotyls or from the dicotyls? (2) Is it from a root, from a stem or from a petiole? (3) Is it monostelic, polystelic or schizostelic? (4) To which of the following varieties do its vasal bundles belong: Closed collateral, open collateral, bi collateral, concentric with a central xylem, concentric with a central phloem, or phloem and xylem bundles distinct? (5) Make a diagram (not a detailed drawing) of the cross-section on a sufficient scale, and point out such of the following parts as are present: The xylem of a bundle, the phloem of a bundle, the pith, the epidermis, the periderm, a medullary ray, the endodermis and the pericycle. (6) Indicate which of the following tissues are present: Collenchyma, stone cells, bast fibres, ducts, tracheids, complex laticiferous tissue, simple laticiferous tissue, crystal cells, resin cells. (7) In case ducts occur, name the different varieties present. (8) If crystals are present, what is their composition? (9) Is starch present in the specimen, and by what means do you determine? (10) Is tannin present? If so, is it more abundant in the parenchymatous or in the prosenchymatous tissues? (11) What test did you apply to determine the presence or absence of tannin? (12) Judging by the structure, is the specimen from an aquatic

or from a land plant? State reason for your conclusion. (13) What tissues, if any, show lignification? Describe the test by which you determine. (14) What tissues, if any, show cutinization? How did you determine? (15) Are secretion reservoirs present? If so, state their location.

SEVENTY-FIFTH ANNUAL COMMENCEMENT.

The exercises connected with conferring the degree of Graduate in Pharmacy were held at the Academy of Music, Wednesday evening, April 15, at 8 o'clock.

Prayer was offered by W. N. McVickar, D.D.

President Bullock conferred the degree upon the following:

Name.	*Subject of Thesis.*	*State.*
Albaugh, Herbert Spencer,	*Structure of elder bark*,	Ohio.
Alexander, Charles Ellis,	*Effervescing caffeine and potassium bromide*,	Pennsylvania.
Arcularius, Harry Edward,	*Cocillana*,	Missouri.
Armstrong, Walter,	*Spiritus frumenti*,	Virginia.
Arndt, Harry, Jr.,	*Pharmaceutic degrees*,	Pennsylvania.
Aszmann, Louisa Henrietta,	*Carbolic acid*,	Pennsylvania.
Baer, Hermanus Ludwig,	*Estimation of sulphuric acid*,	Pennsylvania.
Baldauf, Leon Kahn,	*Tinctura iodi*,	Kentucky.
Barbiere, Francis Joseph,	*Rhubarb*,	Pennsylvania.
Barrett, Wesley Johnson,	*Phosphorus*,	Pennsylvania.
Bartho, Fremont Kessler,	*Sodii bicarbonas*,	Pennsylvania.
Bartlett, Hannah Frances,	*Magnolia glauca*,	New Jersey.
Becker, Irwin Atwood,	*Calx sulphurata*,	Pennsylvania.
Beckett, Josiah Bee,	*The pharmacist in emergencies*,	New Jersey.
Beeler, Aaron Wilson,	*The future of United States pharmacy*,	Ohio.
Bensinger, George Irvin,	*Datura stramonium*,	Pennsylvania.
Bode, Theodore Christian,	*Terpene*,	Kansas.
Bolton, Jr., Alfred Harrison,	*Syrupus ferri iodidi*,	Pennsylvania.
Boose, William Engelhart,	*Tabacum*,	Pennsylvania.
Booth, James Lofton,	*Kola nut*,	Mississippi.
Booth, Wm. Henry,	*Aqua hydrogenii dioxidi*,	Virginia.
Boyer, John Clinton,	*Arnica*,	Pennsylvania.
Brugler, Elmer George,	*Koumys*,	Pennsylvania.
Buehler, David Alexander,	*Sapo*,	Pennsylvania.
Buss, Marcus,	*Calcium and its compounds*,	Pennsylvania.
Cameron, Charles Sherwood,	*Naphtalinum*,	Maryland.
Campbell, Frank Book,	*Calx chlorata*,	Ohio.
Carman, Harry Alfred,	*Strophanthus*,	Pennsylvania.
Carstens, Louis Peter,	*Chemical analysis of locust bark*,	Iowa.
Case, Luella,	*The scale salts of iron*,	Ohio.
Cassel, James Wilson,	*Examination of commercial glucose*,	Pennsylvania.
Catherman, Isaac Newton,	*Lanolin*,	Pennsylvania.
Clair, Joseph Sylvester,	*Ipecacuanha*,	New Jersey.
Coller, William Warner,	*Cimicifuga racemosa*,	Pennsylvania

Name.	*Subject of Thesis.*	*State.*
Collins, John Hall,	*Pharmacy as a profession,*	Pennsylvania.
Cook, Wm. S. Gray,	*Percolating apparatus,*	Pennsylvania.
Craig, James,	*Tar and its preparations,*	Scotland.
Crayton, Frank Blair,	*Hypericum,*	South Carolina.
Crumbie, James Henry,	*Practical pharmaceutical education,*	Pennsylvania.
Daniels, Charles Rockford,	*Strontium,*	South Carolina.
Davis, John Ellsworth,	*Ergot,*	New Jersey.
Deemer, George Morton Hays,	*Glycerin,*	Pennsylvania.
DeGraffe, Bertha Leon,	*The tannins of some Ericaceæ,*	New York.
Dewees, William Holstein,	*Petroleum,*	Pennsylvania.
DeLorme, John Grenville,	*Geranium,*	South Carolina.
Dickinson, Chas. Seymour,	*Stearic acid,*	Pennsylvania.
Dietrich, Pierce Abbott,	*Cotton plants and derivatives,*	Pennsylvania.
Dill, Benjamin,	*Sponges,*	Pennsylvania.
Dougherty, Albert,	*Beef, wine and iron,*	Delaware.
Draper, Oscar Carmen,	*Variations in official tinctura opii,*	Delaware.
Dutt, William,	*Estimation of opium plaster,*	Ohio.
Ehman, Joseph William,	*Solution of magnesium citrate,*	Pennsylvania.
Elliott, Boyce,	*Problems confronting the American Pharmacist,*	South Carolina.
Farrell, Martin Edward,	*Cascara sagrada,*	Pennsylvania.
Farrow, Charles Taylor,	*Syrup of ipecacuanha,*	Pennsylvania.
Felker, Harry,	*Benzoin,*	Pennsylvania.
Fischer, Frederick Franklin,	*Oleum morrhuæ,*	Pennsylvania.
Fitzgerald, Samuel Walter,	*Tinctures,*	Pennsylvania.
Flenniken, John Byron,	*A pharmacist and the public,*	Pennsylvania.
Fluck, Franklin Wilson,	*Ethyl chloride,*	Pennsylvania.
Freeman, Josiah Kisterbock,	*Compressed tablets,*	Pennsylvania.
Gabriel, Robt. Rudolph,	*Cascara sagrada,*	Pennsylvania.
Geiger, Walter Samuel,	*Eriodictyon,*	Pennsylvania.
Genz, George Leonard,	*Commelina virginica,*	Wisconsin.
Goldsmith, Lee,	*Glycerin,*	Pennsylvania.
Good, Robert Franklin,	*Oleum gaultheriæ,*	Pennsylvania.
Graham, Harry Edgar,	*Therapeutics and hygeine,*	Pennsylvania.
Griesemer, James Adam,	*Electricity,*	Pennsylvania.
Griswold, Charles Maust,	*Acetic acid as a menstruum,*	Pennsylvania.
Haig, Jr., Charles Roberts,	*Acidum boricum,*	Pennsylvania.
Haines, Charles Henry,	*Unguentum aquæ rosæ,*	Maryland.
Hall, Robert Carson,	*Iodine,*	Pennsylvania.
Hance, George Headley,	*Pharmaceutical still,*	Pennsylvania.
Hannan, Frank William,	*Honey,*	Pennsylvania.
Harrell, Herbert Dean,	*Spirit of camphor,*	West Virginia.
Harris, Clarence Mulford,	*Cod liver oil,*	New Jersey.
Haymaker, Milo Miller,	*Stillingia,*	Missouri.
Hayman, Walter,	*Hydrargyri sulphidum rubrum,*	Pennsylvania.
Heckerman, Adam Bruce,	*Fluid extract of geranium,*	Pennsylvania.
Heffner, Edgar Franklin,	*Potassii chloras,*	Pennsylvania.
Heinbach, Frank Walton,	*Camphor,*	Pennsylvania.

Name.	*Subject of Thesis.*	*State.*
Helfrich, Edward Daniel,	*Podophyllum*,	Ohio.
Hellyer, Edwin Fayette,	*Acacia*,	Pennsylvania.
Herzog, Albert,	*Aqua hydrogenii dioxidi*,	Missouri.
Heyser, Jonas Edward,	*Advertising as a pharmacist*,	Pennsylvania.
Hiffmeyer, William Joseph,	*Belladonna*,	Pennsylvania.
Hippler, Harry Richmond,	*Fluid extracts*,	Pennsylvania.
Hodil, Frank Dilworth,	*Eucalyptus*,	Pennsylvania.
Holt, James Stephen,	*Cascara sagrada*,	Pennsylvania.
Howard, John Edgar,	*Water*,	Pennsylvania.
Humpton, Albert Norton,	*Roots and leaves*,	Pennsylvania.
Hunt, Warren Ernest,	*Administration of castor oil*,	Pennsylvania.
Ink, Charles Thomas,	*Camphor : its preparation*,	Ohio.
Ireland, Wm. Page,	*Belladonna*,	New Jersey.
Jackson, Thomas,	*Prescriptions*,	Pennsylvania.
Jacoby, Charles Nicholas,	*Antiseptics and disinfectants*,	Wisconsin.
James, Robert Rosser,	*Heraclei lanati fructus*,	Pennsylvania.
Johnson, Albert Burtis,	*Estimation of ammonium chloride tablets*,	New Jersey.
Johnson, Charlton Graham,	*Solanum Carolinense*,	Georgia.
Johnson, Olive Curtis,	*Assay of tincture of nux vomica*,	Pennsylvania.
Jones, John Comer,	*Sassafras*,	New Jersey.
Jones, Lester David,	*Emulsion of cod liver oil*,	Iowa.
Jones, Thomas Morgan,	*Mine water*,	Pennsylvania.
Kelchner, Charles Eber,	*Some criticisms of U. S. P., 1890*,	Pennsylvania.
Kelley, Alfred Logan,	*Camphor*,	Delaware.
Ketterer, Martin,	*Repercolation*,	Pennsylvania.
Killiam, William Smith,	*Cod liver oil*,	Delaware.
Kline, Frank,	*Iodine*,	Pennsylvania.
Knoefel, Arthur Eugene,	*Syrupi acidi hydriodici*,	Kentucky.
Kunz, Charles Cornelius,	*Calomel*,	Pennsylvania.
Lachenmayer, Henry Julius,	*Kola*,	Pennsylvania.
Laucks, William Irwin,	*Preparations of iron*,	Pennsylvania.
Lautenbacher, Wm. Roth,	*Strophanthus*,	Pennsylvania.
Lee, Harry Francis,	*Sumbul*,	Pennsylvania.
Leech, David Malcolm,	*Ipecacuanha*,	Pennsylvania.
Le Sage, George Louis,	*Acetum opii—1850 U. S. P.*,	New York.
Leslie, Harry Carter,	*Assay of acetic acid*,	Pennsylvania.
Lewis, Howard Hornberger,	*Cod liver oil*,	Pennsylvania.
Light, James Raymond,	*Infusum digitalis*,	Pennsylvania.
Littlefield, Bradford Allen,	*Potassa sulphurata*,	New York.
Lloyd, Ephraim Augustus,	*Kaolin*,	New Jersey.
Longmire, Charles Henry,	*Iron, its preparations and uses*,	Pennsylvania.
Luburg, Leon Franklin,	*Glycerin suppositories*,	Pennsylvania.
McConomy, Paul Lucien,	*Pills*,	Pennsylvania.
McCracken, James Henry,	*Estimation of tannin in fluid extract of Rhus glabra*,	Pennsylvania.
McHenry, Walter Greenleaf,	*Ipecac and its preparations*,	Pennsylvania.
McLaughlin, Chas. Bishop,	*Rhizome of Smilacina racemosa*,	New Jersey.

Name.	*Subject of Thesis.*	*State.*
Malsbury, Hillman Gaskill,	*Successful pharmacist,*	New Jersey.
Maples, Murff Ford,	*Acidum sulphurosum,*	Colorado.
Martin, Merry Omah,	*Palmetto,*	Mississippi.
Marshall, Charles Gross,	*Diluted hydrochloric acid,*	Pennsylvania.
Meier, August Jacob,	*Pyroligneous spirit,*	Germany.
Meredith, Charles Howard,	*Kaolin,*	Pennsylvania.
Metz, Abram Lehman,	*The ideal pharmacist,*	Pennsylvania.
Miller, James Augustus,	*Balsam of tar,*	Iowa.
Miller, John Henry,	*Hydrochloric acid U. S. P.,*	Pennsylvania.
Moleen, George Arnold,	*Cocillana,*	Colorado.
Montgomery, John Custis,	*Present art of Galen,*	Pennsylvania.
Moore, George Cooper,	*Asafœtida,*	Delaware.
Mosebach, Ferdinand Adam,	*Syrup of iron iodide,*	Pennsylvania.
Mountaine, Wm. Lewis,	*Extractum theæ fluidum,*	Maine.
Musselman, John,	*Professional pharmacy,*	Pennsylvania.
O'Donnel, David Howard,	*Dorema ammoniacum,*	Pennsylvania.
Page, Edward Lewars,	*The chemist in pharmacy,*	Pennsylvania.
Parker, Howard Eugene,	*Orchids,*	Connecticut.
Pellett, Edmund Burnham,	*Pills,*	Pennsylvania.
Phillips, Wm. Newton,	*Iodine,*	Ohio.
Pierce, Herman Judson,	*Chemical analysis of Canada thistle,*	Pennsylvania.
Pilgrim, John W.,	*Opium,*	New Jersey.
Place, Charles Ross,	*Estimation of phosphoric acid,*	Pennsylvania.
Post, Edward Meigs,	*Goulard's extract,*	New Jersey.
Powell, Charles Deitz,	*Sulphur,*	Pennsylvania.
Pulsifer, James Perlie,	*Syrupus Pini albi compositus,*	New Jersey.
Reed, Arthur Benjamin,	*Gelatin,*	Pennsylvania.
Reeve, James Whitaker,	*Suppositories,*	Pennsylvania.
Rewalt, Jay Wm.,	*Cascara sagrada,*	Pennsylvania.
Richardson, Neafie,	*Scale pepsin,*	New Jersey.
Ricker, Wm. Homer,	*Tobacco,*	Pennsylvania.
Roach, Charles Peter,	*Sodium bisulphite,*	Pennsylvania.
Robinson, Raleigh,	*Vanilla,*	Pennsylvania.
Ross, Frank Budd,	*Ferrum,*	New Jersey.
Rovno, Pinkas,	*Acidum sulphuricum dilutum,*	Russia.
Rudy, Harry Robert,	*Spongia usta,*	Maryland.
Ryland, George Bertram,	*Cork,*	Maryland.
Sager, Verner Edward,	*Mecca oil,*	Ohio.
Sallada, Hunter Albert,	*Crystallization,*	Pennsylvania.
Schabinger, Charles,	*Zea,*	Delaware.
Schad, Harry John,	*Grape juice,*	Pennsylvania.
Schaeffer, Otis Oliver,	*Estimation of caffeine in kola,*	Pennsylvania.
Schindel, David Philip,	*Preservation of syrups,*	Maryland.
Schmieg, Joseph Alphonse,	*Petroleum,*	Pennsylvania.
Schneider, Kingsley Clark Thompson,	*Fluid extract of coca,*	Ohio.
Schnurman, Harry Samuel,	*Fungi as medicine,*	Pennsylvania.
Schroeder, Johann Heinrich,	*Chemistry of some cassias,*	Germany.

Name.	*Subject of Thesis.*	*State.*
Scott, Jas. Patrick Edward,	*Nux vomica*,	Pennsylvania.
Sellers, Walter Spangler,	*Mentha piperita U. S. P.*,	Pennsylvania.
Semmel, Frank Pierce, Jr.,	*Extractum nucis vomicæ*,	Pennsylvania.
Seyforth, Julius Frederic,	*Acetic acid in pharmacy*,	Kansas.
Sharp, Warren Reed,	*Acetanilidum*,	Pennsylvania.
Shenk, John Benjamin,	*Grindelia*,	Pennsylvania.
Sherwin, Robert Suthers,	*Syrupus pini albi compositus*,	Pennsylvania.
Shreve, Alexander,	*Cannabis sativa*,	New Jersey.
Simpler, Willard Eugene,	*Salicylic acid*,	Pennsylvania.
Sisler, Loerey Wm.,	*Chloralhydrate*,	Pennsylvania.
Smith, John Ritner,	*Pills, ointments and plasters*,	Pennsylvania.
Smith, Paul,	*Acetylene*,	Pennsylvania.
Spath, George Balthaser,	*Stoichiometry*,	Pennsylvania.
Spotts, Albert Oyster,	*Boric acid*,	Pennsylvania.
Stahel, Albert William,	*Belladonna*,	Wisconsin.
Steadman, Merril Linn,	*Estimation of ammonium chloride*,	Pennsylvania.
Stephens, Halsey De Forrest,	*Wintergreen*,	New Jersey.
Stevens, Thomas Ray,	*The pharmacist as a bacteriologist*,	Indiana.
Stine, Howard F.,	*Aromatic spirit of ammonia*,	Pennsylvania.
Stout, Edward Clayton,	*Antipyrin*,	Pennsylvania.
Stroup, Freeman Preston,	*Oleum Cicutæ maculatæ*,	Pennsylvania.
Stump, Adam Franklin Marshall,	*Ergota*,	Pennsylvania.
Swainbank, Charles Miller,	*Fabiana imbricata*,	Pennsylvania.
Swartz, Calvin I.,	*Elixir of iron, quinine and strychnine*,	Delaware.
Thompson, Alexander Peterson,	*Poisons*,	Pennsylvania.
Thrush, Morris Clayton,	*Solanum Carolinense*,	West Virginia.
Thum, John Carl,	*Liquor magnesii citratis*,	Pennsylvania.
Tiefenbach, Jacob Fred.,	*Preparation of zinc oxide*,	Pennsylvania.
Towles, Therret Rankin,	*Assay of aromatic sulphuric acid*,	Kentucky.
Townsend, James Vaughan,	*Analysis of Dover's powder*,	New Jersey.
Waldner, Paul Jacob,	*Stramonium*,	Pennsylvania.
Wasley, Fred. Stanley,	*Passiflora*,	Pennsylvania.
Watkins, Mack McInnis,	*Zinc oxide ointment*,	Mississippi.
Watson, Jonathan Ingham,	*Coptis trifolia*,	Pennsylvania.
Weida, Charles Arthur,	*Acetylene*,	Pennsylvania.
Weiss, William Erhard,	*Assay of fluid extract of coffee*,	Ohio.
Weston, Edythe,	*Assay of fluid extract of guarana*,	Delaware.
Whitacre, Lewis Reese,	*Aluminium*,	New Jersey.
Wild, George Fred.,	*Aromatic spirit of ammonia*,	Indiana.
Williamson, Thomas McGill,	*Assay of manna*,	Maryland.
Wilson, Willets,	*Licorice*,	New York.
Wissmann, Herman Bayard,	*Glycerite of carbolic acid*,	Pennsylvania.
Woltman, Enos Frederick,	*Abrus precatorius*,	Pennsylvania.
Young, Ben Lee,	*Chlorine in nitric acid*,	Alabama.
Ziegler, John Clayton,	*Spermaceti*,	Pennsylvania.
Zipp, Charles James,	*Acid salicylicum*,	New York.
Zullinger, Aaron Henry,	*Syrupus hypophosphitum U.S.P., 1890*,	Pennsylvania.

STATES AND COUNTRIES REPRESENTED BY THE GRADUATING CLASS.

Alabama	1	Kentucky	3	Russia	1
Colorado	2	Maine	1	Scotland	1
Connecticut	1	Maryland	6	South Carolina	4
Delaware	8	Mississippi	3	Virginia	2
Georgia	1	Missouri	3	West Virginia	2
Germany	2	New Jersey	20	Wisconsin	3
Indiana	2	New York	5		
Iowa	3	Ohio	11	Total	221
Kansas	2	Pennsylvania	134		

Special certificates for a two years' course in general, applied and analytical chemistry were awarded to:

Irwin Atwood Becker, Pennsylvania.
William Joseph Doyle, Iowa.
Warren Whitney Flitcraft, New Jersey.
Clarence Blaine Gowen, Georgia.
John Clayton Ziegler, Pennsylvania.

AWARD OF PRIZES.

The Procter Prize of a gold medal and certificate for the highest grade of scholarship and a meritorious thesis was given to Louis P. Carstens. In connection with this, Harry R. Rudy received the grade of distinguished, and L. K. Baldauf and J. Henry Schroeder the grade of meritorious.

The Maisch Memorial Prize of a Zentmayer microscope, offered by the family of the late Professor Maisch, for original histological work on American plants, was awarded to Charlton G. Johnson. The following graduates received honorable mention therewith: M. C. Thrush, Charles B. McLaughlin, H. Frances Bartlett, and Robert R. James.

The Chemical Prize of an analytical balance, offered by Professor Samuel P. Sadtler for original quantitative analysis, was given to J. Henry Schroeder, with honorable mention of Bertha L. DeGraffe and Freeman P. Stroup.

The American Journal of Pharmacy Prize of $25, offered by Professor Henry Trimble, was awarded to Bertha L. DeGraffe, with honorable mention of J. Henry Schroeder.

The Herbarium Prize of $25 in gold, offered by Professor Edson S. Bastin for the best collection of herbarium specimens, was awarded to Bertha L. DeGraffe.

The John M. Maisch Prize of $20 in gold, offered by Mr. J. H. Redsecker, of Lebanon, Pa., for histological knowledge of drugs, was given to Harry R. Rudy, with honorable mention of Louis P. Carstens, Leon K. Baldauf, Bertha L. DeGraffe, Edgar F. Heffner, Edward D. Helfrich, Herman J. Pierce and J. Henry Schroeder.

The William B. Webb Memorial Prize, consisting of a gold medal, for general excellence in operative pharmacy, specimens and committee examinations, offered by Mrs. Rebecca T. Webb, was awarded to Louis P. Carstens, with honorable mention of Harry R. Rudy and Thomas R. Stevens.

The Operative Pharmacy Prize of $25 in gold, offered by Professor Joseph P. Remington for the best examination in that branch, was given to Olive C.

Johnson, with honorable mention of Louis P. Carstens, Charles B. McLaughlin and Harry R. Rudy.

The Robinson Chemical Prize of a gold medal and certificate, offered by Mr. James S. Robinson (Class of 1869), of Memphis, Tenn., for the best examination in general and analytical chemistry, was awarded to Jonathan I. Watson.

The valedictory address was given to the graduating class by Professor Edson S. Bastin.

The farewell supper of the professors to the graduating class was given in the Museum of the College, Tuesday evening, April 14th. The officers and trustees of the College were present, with a number of invited guests, and a pleasant evening was passed in disposing of the menu and in listening to the choice selections rendered by the students' orchestra.

ALUMNI ASSOCIATION OF THE PHILADELPHIA COLLEGE OF PHARMACY.

The Thirty-second Annual Meeting of the Alumni Association of the Philadelphia College of Pharmacy was held in Alumni Hall, at the College Building, No. 145 North Tenth Street, on Monday afternoon, April 13, 1896.

President Jacob S. Beetem, '78, presided, and read his annual address, in which he said: "To-day we miss the familiar face of one who, for twenty-seven years, never missed an annual meeting of the Alumni Association, during which period he held the office of Treasurer. In the death of Edward C. Jones, our Association has lost one of its organizers, the spirit who held together and nursed it in its infancy, and faithfully stood by it in its youth and manhood. In fact, it has been said he was for several years "the Alumni Association." He did a great amount of valuable work for the Alumni, was faithful and correct, had the full confidence of his associates, and deserved it. His life was a patient devotion to what he undertook to do, and he always had pleasure in doing it. His earthly reward was 'thank you,' and we may truthfully say of him: 'Well done, good and faithful servant.' He is honored in perpetuating his memory in the Edward C. Jones Free Scholarship, and I earnestly ask every graduate and friend of Edward C. Jones to subscribe towards this Memorial Fund. It is estimated that $2,000 is necessary to carry out the proposed plan, of which amount $440.15 has already been paid into the treasury, with several dollars subscribed."

The President also recommended that the *Alumni Report* be issued each month of the year, instead of nine issues, as it is now, and that it be placed upon a subscription basis of 50 cents per year to our membership, and that all the students receive it gratuitously.

The Secretary, Wm. E. Krewson, '69, presented his Sixteenth Annual Report as Secretary, in which he reviewed the work of the Association for the past year.

During the year, 220 new members were added—8 who paid the required fee, 35 who were members of previous College Review Quiz Classes and who were deferred last year on account of being under age, and 177 who were members of this year's College Review Quiz Class.

The membership now numbers 2,710, after deducting those who have died, making a net gain of 200 new members for the year.

The report of the Memorial Committee showed that 20 of the members had died during the year.

The Secretary also paid a tribute to our late Treasurer, Edward C. Jones, and suggested that, upon each anniversary of his death, his last resting-place be strewed with flowers, as a tribute to his memory.

The Treasurer, Wm. L. Cliffe, '84, reported the receipts from all sources, $4,103.80, and the disbursements, including balance due College as quiz money for 1894 and 1895, and balance of donations to electric plant fund, $3,836.86, leaving a balance in the treasury of $266.94.

The Committee on Revision of By-Laws presented a complete set of new by-laws to conform to the new charter, which, after a few minor alterations, were unanimously adopted.

The following officers were elected for the ensuing year:

President, Dr. J. Louis D. Morison, '88; First Vice-President, Harry L. Stiles, '85; Second Vice-President, James C. Perry, '91; Treasurer, Wm. Lincoln Cliffe, '84; Secretary, Wm. E. Krewson, '69; Corresponding Secretary, F. Wm. E. Stedem, '82. Board of Directors, for three years: Wallace Procter, '72; C. Carroll Meyer, '73; Wm. A. Bullock, '86, and Theodore Campbell, '93; for two years, to fill two vacancies: Jacob S. Beetem, '78, and Cornelius E. Spencely, '78. Second Vice-President Jos. Crawford, '84, positively declined the nomination for any office, on account of pressure of business duties.

The thirty-second annual reception, to the seventy-fifth graduating class, was held in Association Hall, corner Fifteenth and Chestnut Streets, on Monday evening, April 13, 1896, and was a very successful and pleasant event.

An interesting concert programme was played by Bastert's Parlor Orchestra. President Jacob S. Beetem presided, and made a few introductory remarks, and welcomed the new members.

Charles Howard Meredith, of Media, Pa., delivered the annual class oration, which was well rendered, and he paid a glowing tribute to our late Treasurer, Edward C. Jones; Freeman Preston Stroup, of Rouseville, Pa., recited the poem dedicated to the graduating class; Charles Thomas Ink, of Columbiana, O., gave the history of the Class of 1896; and Kingsley C. T. Schneider, of Berea, O., foretold the future of the class in a highly creditable manner.

The Alumni Gold Medal was presented to Louis Peter Carstens, of Davenport, Ia.; and the eight prize certificates, for the highest general average in each of the branches, were awarded to the following students:

Pharmacy, John Henry Miller, Ephrata, Pa.; chemistry, Johann Heinrich Schroeder, Bossum, Germany; materia medica, Edgar Franklin Heffner, Centralia, Pa.; pharmacognosy (specimens), Jos. Wm. Ehman, Williamsport, Pa.; general pharmacy (committee), Leon Kahn Baldauf, Henderson, Ky.; operative pharmacy, Miss Olive Curtis Johnson, Danville, Pa.; analytical chemistry, Aaron Henry Zullinger, Chambersburg, Pa.; microscopical botany (vegetable histology), Robert Suthers Sherwin, Scranton, Pa.; for the best collection of indigenous plants, Albert Wm. Stahel, Roscobel, Wis. The prize for the highest general average of the Junior Class, to Clarence Osborne Snavely, Lebanon, Pa.

A new departure was inaugurated this year in the presentation of the prize certificates. All of the successful prize students were invited upon the platform, when the certificates were presented by David H. Ross, collectively, to them, and Johann H. Schroeder accepted them in a neat speech. W. E. K.

MINUTES OF COLLEGE MEETINGS.

PHILADELPHIA, March 30, 1896.

The stated annual meeting of members of the College was called this day, at 4 o'clock P.M., President Chas. Bullock in the chair. The chairman announced in suitable words the recent demise of Robert England, member of the College and of its Board of Trustees. It was, on the motion of William J. Jenks, resolved that, as an expression of profound sorrow, and as a tribute of respect, the business of the meeting be deferred and the session adjourned.

Meeting thereupon adjourned. WILLIAM B. THOMPSON,
Secretary.

PHILADELPHIA, April 6, 1896.

The adjourned annual meeting of members of the College was held this day, at 3.30 P.M., Vice-President Jenks presiding.

The minutes of the previous stated meetings were read and adopted. The records of transactions of the Board of Trustees for January, February and March, 1896, were presented, and on motion approved. The usual annual reports of officers and permanent committees were now requested. The Committee on Publication submitted a general statement, with financial transactions for fiscal term of 1895 and 1896. The finances of the committee were shown to be in a satisfactory condition. The increase of receipts during the year was $375.60, and increase of expenses $97.06, leaving a net increase of $278.54. The number of subscribers was also shown to have increased materially.

The editor of the AMERICAN JOURNAL OF PHARMACY submitted the following:

"This report covers the period from April 1, 1895, to March 1, 1896, inclusive. During that time there have been published 74 original papers from 36 authors. These were exclusive of editorials and reviews, and only included papers prepared solely for this JOURNAL. While the number of such papers diminished by 5 from those of the previous year, yet they exceeded the space occupied, by 77 pages. The number of pages of such original matter during the past year has been 374, against 297 pages the previous year, and 159 pages two years ago. It will be seen that, on including editorials, reviews, minutes of the College and Pharmaceutical Meetings, there has been but little space for abstracts from other journals.

Of the 36 authors contributing original matter, 13 were members of the College and 23 were not, thus indicating that the JOURNAL has liberal support outside of the membership of the College. The members contributed 41 papers and the non-members 33.

The illustrative features have been continued on a rather more liberal scale than during the preceding year, and this move has met with the hearty approval of both subscribers and contributors. 17 of the papers were accompanied by

illustrations, numbering 76 separate figures, or an average of 6⅓ for each number.

The total number of pages of reading matter during the year was 642, an average of 53½ pages for each issue, the same as the preceding year."

The report was accepted.

The Curator presented a statement, a brief summary of which is as follows:

"Your Curator would respectfully report that the resolutions passed at the last annual meeting of the College, to make certain improvements in the Museum, have been carried out, and in consequence the shelf room has been rearranged to accommodate fully 50 per cent. more specimens. But even with this extension, the time is fast approaching when more and more shelf room will be required to accommodate the specimens. Your Curator has now in process of rearrangement the entire collection of the Museum on a basis of classification that is simpler and more ready of access than the plan heretofore followed.

"The additions to the Museum during the year have been many and interesting, and in this connection the College Pharmaceutical Meetings have been no small factor in inducing presentations of specimens. I am,

"Yours respectfully,

"J. W. ENGLAND,

Philadelphia, March 30, 1896. "*Curator.*"

The Librarian summarized the state of the Library and the receipt of volumes as follows:

"The Librarian respectfully reports that, during the year 1895, there have been added to the Library by donation 3,183 volumes, in addition to the exchanges made by the JOURNAL OF PHARMACY, and by purchase twenty-eight volumes, many of them being works of great interest to botanical and chemical science. The Library is being more and more consulted by both members and students, and by others who find works of reference in our Library not accessible elsewhere.

"During the year there have been spent $93.05 for binding, and $218.58 for new books. All of which is respectfully submitted."

All of the above were ordered to be inscribed on the minutes of the College. The Special Committee on Delinquent Members concluded their business, presented the facts as ascertained by them, and recommended that those whose names were indicated should be dropped from the roll of the College, as being delinquent, and more than *three* years in arrearage of dues. The recommendation of the committee was sustained by a unanimous vote of the members, and the committee discontinued.

Dr. Adolph W. Miller read letters of acknowledgment from Dr. Frederick Hoffman, at Berlin, Dr. Oscar Loew, of Tokyo, Japan, and Mr. P. L. Simmonds, of London, in response to notice of their election as honorary members of this College.

Prof. F. G. Ryan offered the following resolutions, which, after being discussed with some difference of opinion, were adopted, and the Secretary was directed to transmit a copy to each representative in Congress from Pennsylvania.

Resolutions offered and passed at meeting of members of Philadelphia College of Pharmacy, by Prof. F. G. Ryan:

Resolved, That it is the sense of the Philadelphia College of Pharmacy that the general adoption and use of the metric system of weights and measures in the United States is very desirable, and would prove of great benefit to the people; that our trade relations with other nations would be stimulated by the unity of weights and measures.

Resolved, That we approve of and heartily endorse the Bill now before Congress, known as H. R., No. 7,251, introduced by the Honorable C. W. Stone, making the metric system the legal standard of weights and measures for the United States.

Resolved, That a copy of these resolutions be sent to each representative in Congress from the State of Pennsylvania.

The Chairman appointed the following-named gentlemen to represent this College at the sessions of the Pennsylvania Pharmaceutical Association, at Mt. Holly Springs, in June next: William McIntyre, Henry Trimble and Dr. C. B. Lowe. On motion to proceed to nominations and election of officers of the College for the ensuing year, the following were duly chosen:

President, Chas. Bullock; First Vice-President, Robert Shoemaker; Second Vice-President, William J. Jenks; Treasurer, James T. Shinn; Corresponding Secretary, A. W. Miller; Recording Secretary, Wm. B. Thompson; Curator, Jos. W. England; Librarian, Thomas S. Wiegand; Editor, Henry Trimble; Publication Committee, Henry N. Rittenhouse, Samuel P. Sadtler, Wallace Procter, Joseph W. England; Trustees for three years, T. Morris Perot, Jos. P. Remington, Edson S. Bastin; Trustee for unexpired term of Robert England, deceased, William L. Cliffe.

Meeting, on motion, adjourned.

WILLIAM B. THOMPSON, *Secretary.*

SEVENTY-FIFTH ANNIVERSARY OF THE PHILADELPHIA COLLEGE OF PHARMACY.

On Wednesday evening, April 22, 1896, the College celebrated her seventy-fifth anniversary by a banquet in the Museum, and a display in the Library of the literature thus far contributed by members and Faculty. About one hundred and fifty guests assembled in the Library, where the above-mentioned exhibit was inspected, as well as one of selections from the Martindale herbarium. About 8 o'clock the company proceeded to the Museum, which had been temporarily fitted up as a banquet hall, where dinner was served, after which addresses were made by some of the invited guests and members of the College.

Prof. Joseph P. Remington acted as toast-master, and the first proposed was "Our City," responded to by the Mayor, Hon. Charles F. Warwick. The President of the College, Mr. Charles Bullock, followed with a brief history of the College. The other speakers were: Dr. William Pepper, on "The University of Pennsylvania;" Dr. Edward Brooks, on "Technical Education;" Hon. George S. Graham, District Attorney, on "Pharmaceutical Legislation;" Dr. J. W. Holland, Dean of the Jefferson Medical College, on "Our Sister College;" Hon. A. K. McClure, on "The Press;" Dr. Adolph W. Miller, on the "Alumni Association," and Dr. Horatio C. Wood, on the "Medical Profession."

The room was profusely decorated with tropical plants, and the proceedings were interspersed with choice musical selections by the orchestra.

A feature of the entertainment was the elaborate souvenir menu, which contained pictures of all the buildings that had been occupied by the College, and a historical record of the progress and development of the College since its foundation.

The success of the evening was largely due to the persistent efforts, during several months past, of Mr. Howard B. French, Chairman of the Entertainment Committee.

A more detailed account of this interesting occasion will be published shortly in the *Alumni Report*. Those of our readers who desire copies can have them mailed free by addressing the *Alumni Report*, 145 North Tenth Street, Philadelphia.

OBITUARY.

CHARLES O. CURTMAN.

Dr. Charles O. Curtman, of the Missouri Medical College, died on the morning of April 22d, after ten days' illness, from the effects of the grippe.

ROBERT ENGLAND.

Robert England, son of William and Hannah England, was born at Passyunk Road and South Street, this city, on February 21, 1825, and died of capillary bronchitis, after a short illness, at his home, southwest corner of Tenth and Catharine Streets, on March 29, 1896. Funeral services were held in St. Paul's M. E. Church, Catharine Street, above Sixth, on April 1, and at Mt. Moriah Cemetery.

In early youth, Mr. England was apprenticed to John W. Simes, druggist, at Eighteenth and Market Streets, for a term of nine years, "to learn the art, trade and mystery of a druggist and an apothecary." In 1847 he started in the drug business for himself, at the southeast corner of Tenth and Christian Streets. Remaining there three years, he moved up one square to the southwest corner of Tenth and Catharine Streets, where he has carried on business for nearly half a century. He was one of the oldest living graduates of the Philadelphia College of Pharmacy, having received his diploma on March 16, 1846, his thesis being entitled "American Ipecac." From the day of his graduation he evinced the deepest interest in the welfare of his *Alma Mater* and every movement which aimed for her advancement was assured in advance of his sympathy and outspoken support. Elected a member of the College on November 8, 1859, he was made a member of the Board of Trustees on September 28, 1874, and has been continuously re-elected, serving on many important committees. He never forgot the trials of student days, and always had a warm word of sympathy for the interests of the "boys," as he called them, whenever they needed some one to speak in their behalf.

Elected a member of the Alumni Association at the first annual meeting in 1864, he soon saw the power for good its members might wield, as an organized body, on behalf of the *Alma Mater* and the interests of pharmacy. And in the early years of the Association, when friends were few and interest lax, he strove with earnestness to promote its growth and advance its welfare.

During the Civil War he was apothecary to the Volunteer Corps stationed in the lower part of the city. In 1855 he was elected a member of the Board of Health of Philadelphia. For many years he was President of the Third Sectional School Board. About fifteen years ago he was nominated by the reform element of the ward for Select Council, and received the endorsement of the Committee of One Hundred.

The Pharmaceutical Examining Board of the City of Philadelphia was created in 1872, and at the request of Mayor Stokley—who had been vested by the Legislature with the power of appointing its members—the Philadelphia College of Pharmacy submitted names of representative pharmacists for appointment on the Board. Mr. England's name was on this list, and, after appointment, he served as a member of the Board, and as its treasurer, until it went out of existence in 1887, upon the passage of the law creating the State Examining Board. The local law, at the time of its passage, was very unpopular, but the aggressive and yet tactful work of the Board—of which Mr. England was a most active member—soon won the respect of local druggists, and paved the way towards the passage of the State law.

Mr. England believ d that one of the evils of the drug trade was that many pharmacists confined their energies too closely to their every-day work, instead of allying themselves with interests in the world at large, and that such action, in view of the very detailed nature of the drug business, must oftentimes result in the taking of a too contracted view of life and its real purposes. Hence, he actively identified himself with a number of charitable and educational institutions. He was a member of St. Paul's Methodist Episcopal Church, and treasurer of the Board of Sustentation of the Philadelphia Methodist Conference. He was treasurer of the Philadelphia Conference Tract Society, a manager of the Church Extension Society, a trustee of the Philadelphia House of Industry, and a director of the Moyamensing Soup Society.

Robert England's sterling qualities were his sturdy manliness, his high ideals of life, his firmness of purpose, and his earnestness in fighting for the right, be the result what it might. Allied with these was a singularly genial and happy temperament that persisted all through life's sunshine and shadows, and brought pleasure into the lives of many. Generous to a fault, his greatest happiness was in making others happy, and the memory of his being will live in the hearts of his friends through the years to come.

His wife, two sons and four daughters survive him. Both sons are graduates of the Philadelphia College of Pharmacy—the one, Joseph W., of the Class of '83, the other, William T., of the Class of '92. W. E. K.

NOTES AND NEWS.

The University of Chicago has established a department of botany, with J. M. Coulter as chief professor. On this account the *Botanical Gazette* has passed into the possession of the same institution, and will be issued by it in the future.

Professor Wyndham R. Dunstan, of the Pharmaceutical Society's Research Laboratory, London, has resigned, to accept the directorship of the Department of Scientific and Technical Research in the Imperial Institute. His work in the future will deal with the vegetable products of the Colonies and India.

The *Chicago College of Pharmacy* has become a department of the Illinois State University, and will remain located in Chicago.

Mistura Ferri Composita is best made, according to W. Johnston (*Phar. Journal*, March 7, 1896), by dissolving the sugar with the ferrous sulphate instead of mixing it with the myrrh and potassium carbonate. To get a really good emulsion, the myrrh (nice, oily pieces) should be rubbed hard with the alkali till it becomes not only pulverulent but pasty, before adding any rose water. When that is done, the emulsion can (when diluted) be safely strained through coarse muslin, to remove bits of bark, etc.

The following conclusions concerning *papain as a digestive agent* have been reached by D. B. Dott (*Phar. Jour.*, March 7, 1896):

(1) That the solvent action of the menstruum alone must be taken into account in experiments conducted on this subject.

(2) That dried papaw juice, and the papain prepared from it by purification and precipitation, have very little solvent action on albumin, either in alkaline or acid solution.

(3) That one brand of commercial papain has very slight solvent action in alkaline solution, but considerable action in acid solution; in these respects resembling a mixture of papain and pepsin.

(4) That even the commercial papain has not nearly the solvent action on albumin which is possessed by pepsin.

The *Therapeutische Wochenschrift*, for April 5th, remarks that lithium bitartrate is much employed by American physicians in the treatment of Rigg's disease (pyorrhœa alveolaris), on the theory that that form of suppurative gingivitis is of a gouty nature. The calcareous collections about the roots of the teeth are said to contain, besides the ordinary calcium carbonate and phosphate, a considerable amount of uric acid, calcium urate, and sodium urate. Dr. E. C. Kirk is cited as having found the lithium bitartrate a remarkably efficacious remedy in this affection, superior to any other lithium salt. Its diuretic action is manifest in many cases, but with some persons it acts as a laxative. Five grains may be given three times a day, dissolved in carbonic acid water.

The other preparation is *lithium bromide*, the efficacy of which in gout is attributed by Mendelsohn to its diuretic effect rather that to any solvent action of the salt. Polakow uses lithium bromide in the following prescription:

	Parts.
Lithium bromide	1 to 2
Sodium bicarbonate	4
Distilled water	200

M. Sig.: Three or four tablespoonfuls to be taken in the course of twenty-four hours.—*N. Y. Med. Jour.*, April 25th.

Tubercles on the Roots of the Soja Bean.—Professor Kirchner (*Cohn's Beiträge zur Biol. der Pflanzen*, xvii, 2, 1895) has conducted a few remarkably interesting experiments in regard to the production and character of these swellings. When the soja beans were cultivated in good soil, such as one would ordinarily employ for experimental purposes, no conspicuous tubercles were formed; but

when to this soil was added a small amount of earth brought from Japan, and presumably infected with the bacteria associated with the plant, tubercles were abundantly formed, and the plants grew more thriftily than under previous conditions. The soil came from Japan in well-soldered metallic boxes. It was black, uncommonly light volcanic ash. It was moist when it arrived, and contained fragments of the roots of the soja plants which had been cultivated therein.

While the observation is not wholly new, it confirms some kindred results, and tends to open up still farther the possibility of more successful cultivation of *Papilionaceæ* in infected soil. Gonnermann (Land. w. Jahr-b. xxii, 1894) has apparently demonstrated that root tubercles are not produced by only one species of bacterium, varying, as some have thought, according to the kind of soil in which they occur.

Although much advance has been made in the direction of settling some of these disputed points, a great deal remains to be learned in regard to turning the observations to practical account. Two of our Southern plants, the so-called "cow-pea" in its multiform varieties, and *Arachis*, appear to be the best subjects of research in this department. The increasing utility of the former as a direct or indirect fertilizer, and of the latter in its new applications in the production of a food, after the extraction of the oil, indicates the desirability of experiments at the Southern stations.—*American Journal of Science.*

Formation of Chlorophyll and Starch.—A very extended series of observations on the mode of formation of starch grains and chlorophyll bodies in plants has led M. E. Belzung to the following general conclusions: The first process which takes place in the embryo is the formation of starch, the result of the activity of the protoplasm, the chorophyll body being a secondary formation. With but few exceptions the chlorophyll pigment is diffused through the protoplasm of the young embryo. The substratum of the future chlorophyll body—leucite or plastid—is always fully formed by the time the seed arrives at maturity; the protoplasm has always a reticulate structure; it is the protoplasm of the amyliferous vacuoles which constitutes the chromatophore or leucite. Those starch grains which are destined to constitute the reserve food material in the ripe seed are an exception to this rule, and increase in the meshes where they are originally deposited. In proportion as the embryo becomes green, and the mass of green corpuscles more abundant, the starch grains are resorbed; they form a part of the material for building up the green chlorophyll grains. In adult green organs, especially leaves, the starch grains which are formed in the light in the chlorophyll bodies are a result of the assimilating power of these latter, being one of the products of the substance itself of the chlorophyll bodies, a kind of secretion from the green substance. The resorbtion of the chlorophyll, which in leaves takes place only at the period of the autumnal fall, is, on fruits, effected almost entirely before they ripen. The two essential phases in the life of a plant—the embryonal phase, during which the green cell is built up at the expense of materials which it has not elaborated, and the adult phase, in which its formative activity is manifested by new embryonal conditions—constitute a remarkable example of organic reversibility.—Morot's *Journal de Botanique*, vol. ix, 1895 (through the *Pharmaceutical Journal*, January 25, 1896).